

# DIGITAL CYPRUS CATALYST FOR CHANGE

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# DIGITAL CYPRUS: CATALYST FOR CHANGE

We live in exponential times, where digital disruption has a profound effect on the way we live and work. In this era of constant change, digital transformation is no longer a matter of choice, but rather a prerequisite for the survival of companies, industries and entire societies.

The digital frontrunners embrace disruption as part of their DNA and inspire people with a vision of how technology enables work to be done differently so that organizations and societies can prosper.

Countries around the world are transforming to increase their productivity and economic performance to ensure social progress. Digital is at the heart of this transformation and can offer unprecedented opportunities.

Cyprus's unique attributes enable the country to be quicker and more effective in managing an accelerated digital rotation. Therefore, the country needs to embrace a national digital vision and align it with an actionable plan that will positively impact the growth of its economy and its overall prosperity.

This was the springboard for us to author the current study under the theme "Digital Cyprus: Catalyst for Change". For this purpose, we joined forces with leading stakeholders in Cyprus, namely the Bank of Cyprus, Cyta and Logicom. In addition, we drew valuable support from the Cyprus Employers and Industrialists Federation and the Cyprus Chamber of Commerce and Industry.

By utilizing qualitative and quantitative data, underpinned by globally accredited methodologies and econometric models, we found that Cyprus has initiated its own digital journey, but there is still room to cover in order to take advantage of the opportunities that digital offers. Success in the digital era will require a change of pace.

In this context, the intent of the study is to serve as a direct call for action for Cypriot companies, institutions and policymakers, so as to urgently promote a shift towards Digital. This challenge is of paramount importance and will create significant long-term value for the country. Cyprus has all the potential to become a frontrunner in the "new" economy.



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# 1. DIGITAL TRANSFORMS THE WORLD AS WE KNOW IT



# 1.1 INTRODUCTION

Imagine being lost in the middle of a country road that you visit for the first time and not being able to check your direction on google maps. Imagine being secluded from all types of social media and not being able to interact with your friends and find out, real-time, what is happening in the world. Imagine not being able to schedule a reminder for an important business meeting on your online calendar, forget about it and never show up. Now, think what do all these scenarios have in common, apart from the fact that they are indeed a bit terrifying.

First of all, they used to be a reality not so long ago; a reality that most of us have often experienced.

Industries and societies are digitally transformed through the adoption and application of rapid advancements in technology and the use of new combinations of information and connectivity.

The foundational changes associated with digital technology application and integration into all aspects of our societies and economies are defined as digital transformation (see Figure 1.1).

## DEFINITION >

<b>DIGITAL</b>	>	Increasing information intensity and connectedness of customer and business resources. Any resource can become digital through the application of technology
<b>DIGITAL DISRUPTION</b>	>	Capabilities and strategies that change the terms of competition and value via new technology-enabled solutions
<b>DIGITIZE</b>	>	Applying technology to customer and business resources. The resulting digital resources give new abilities to people, devices, physical objects, etc. These new abilities form the basis for disruption and digital business
<b>DIGITALIZE</b>	>	The process of turning digitized resources into new sources of revenue, growth, and operational results that generate a premium for your organization
<b>DIGITAL TRANSFORMATION</b>	>	The innovative re-combination of customer and company resources via digital means
<b>DIGITAL BUSINESS</b>	>	An evolution of business that uses new combinations of information and connectivity to create new sources of customer value, company revenue and operational performance
<b>DIGITAL GOVERNMENT</b>	>	The use of digital technologies, as an integrated part of government's modernization strategies, to create public value
<b>DIGITAL CONSUMER</b>	>	Customers that via digital technologies consume products/ services/ content, engage with brands and complete a transaction
<b>DIGITAL CITIZEN</b>	>	Citizens who develop the skills and knowledge to effectively use digital technologies, in order to participate responsibly in social and civic activities
<b>ECOSYSTEM</b>	>	A company's competitiveness network. An increasingly global, multi - industry nexus of partners (suppliers, institutions, customers) and stakeholders through which business problems are solved and outcomes are shaped
<b>PLATFORM</b>	>	An infrastructure that serves as a foundation for value-added services and solutions between producers and consumers through open interfaces

Figure 1.1. The Digital Dictionary

Digital is becoming the new language and disrupts all aspects of our daily affairs; from the way we shop to the way we travel, entertain and become educated, to mention but a few. We can now order our favorite items at the push of one button through Amazon. Netflix sets us to watch our favorite series on our TV and then seamlessly switch to our smartphone or tablet as we head out for lunch. We can start learning a new language or get an educational certificate at our own convenience through the available massive online open courses (MOOCs) offered by companies like Coursera. Fitbit makes us aware of our daily routines and motivates us to improve our fitness by exercising more and keeping track of our progress. If we are travelling abroad and looking for a taxi, we can use Uber in more than 550 cities globally, expecting the same seamless service.

Our smartphones can now be used as digital wallets, enable us to store our card(s) information and use them in retail transactions via payment services like Apple Pay.

The numbers are indeed shocking and manifest our rapid transition to this new and connected world. Just imagine that by 2021, more than 36 billion sensors are expected to be connected worldwide, collecting data with regards to location, motion, light, heat. Individuals are projected to possess more than 20 billion connected devices, on which more than 181,6 billion applications will be installed to facilitate and support all aspects of our everyday life (see Figure 1.2).

All evidence indicates that the new connected "Digital Age" has arrived and has made the process of "digital unlocking" an absolute necessity for everyone.

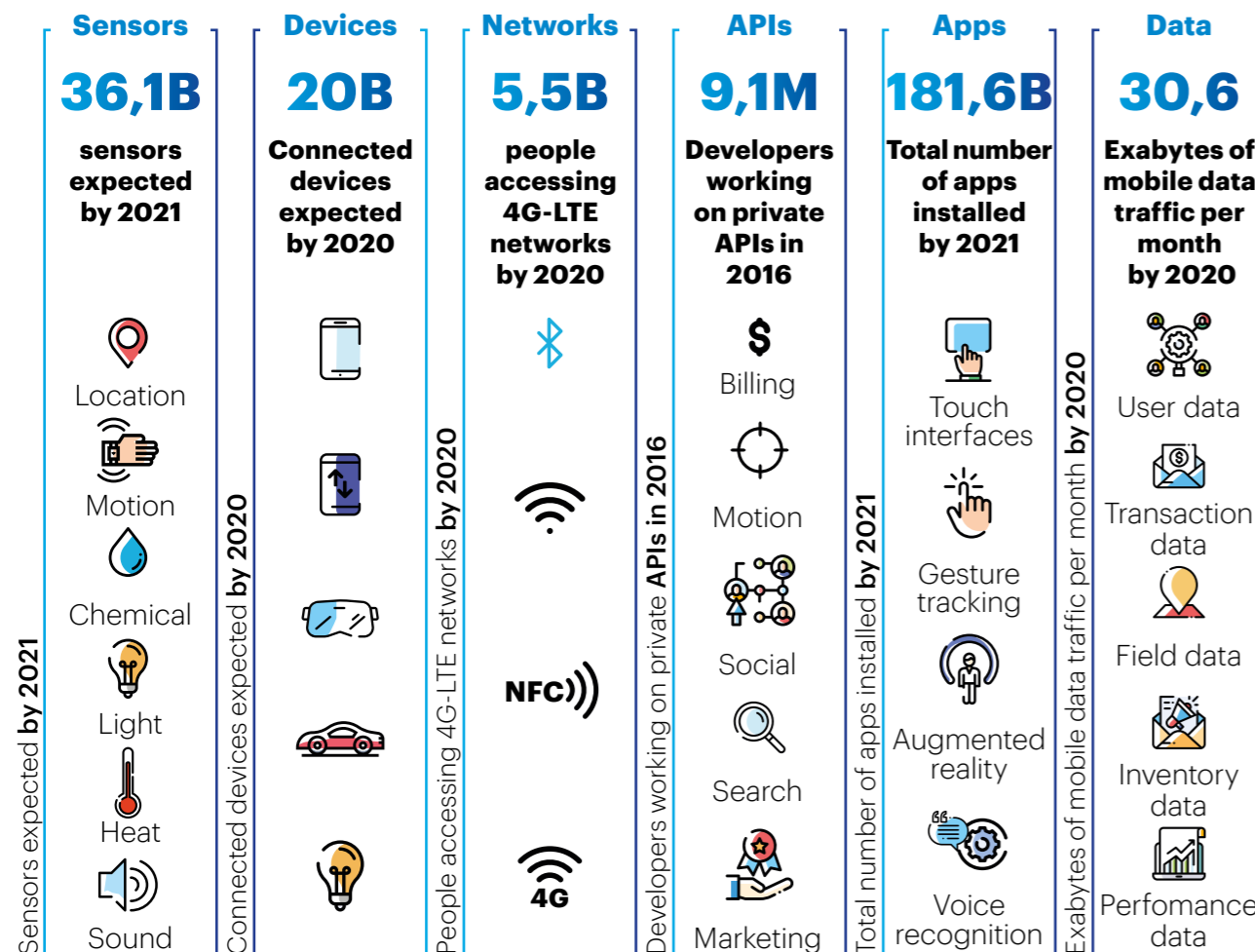


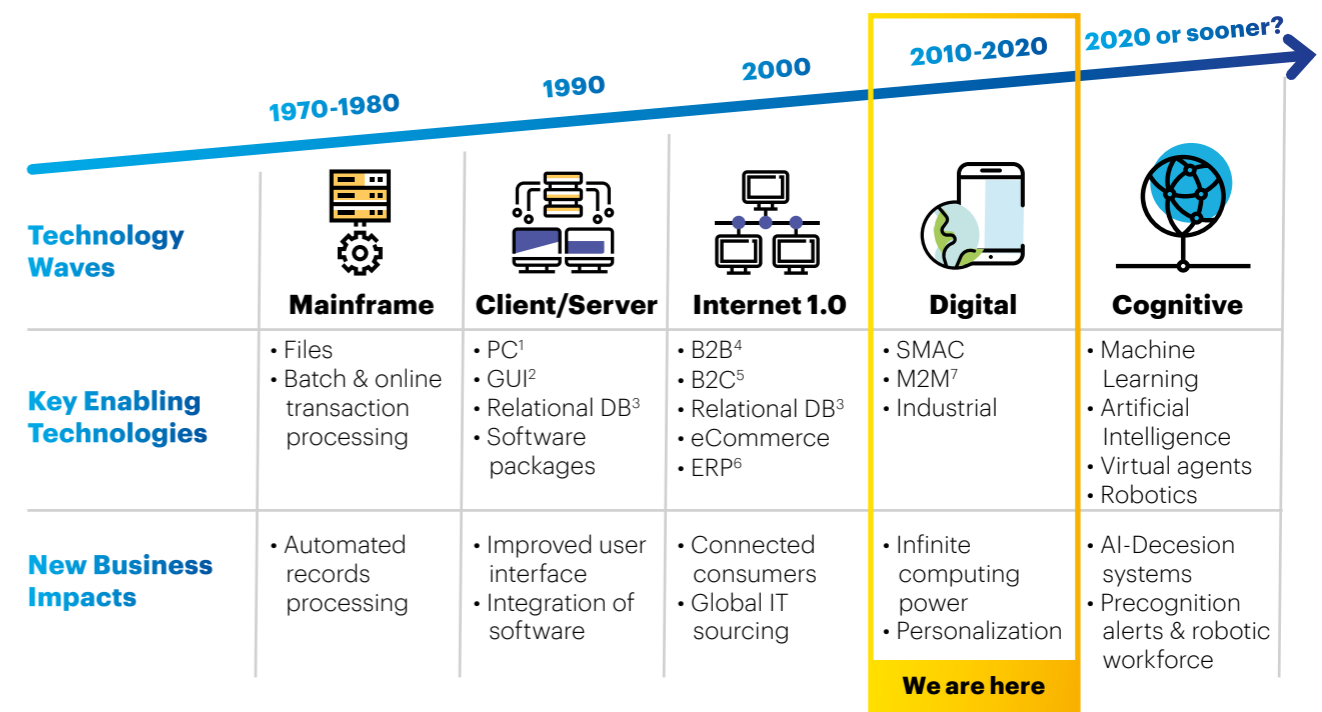
Figure 1.2. Digital creates a brand new connected world

# 1.2 THE TRANSFORMATIVE POWER OF TECHNOLOGY

## DIGITAL TECHNOLOGIES THE "ENGINES" OF OUR DIGITAL FUTURE

But is there an underlying factor that drives a technological revolution so ubiquitous and transformative? And why is this happening now? The digital revolution's potential could certainly not have been reached in the absence of the transformative and ever compounding power of technology.

It has been observed that improvements in computing power have largely kept pace with Moore's Law<sup>1</sup>. During the last decades, we have progressed from the revolutionary advent of personal computers in the 1990s and the widespread use of e-commerce in the 2000s, to the use of Cloud and infinite computing power (see Figure 1.3).



1. PC - Personal Computers 2. GUI - Graphic User Interface 3. DB - Data Base 4. B2B - Business to Business 5. B2C - Business to Consumer 6. ERP - Enterprise Resource Planning 7. M2M - Machine to Machine

Figure 1.3. The evolution of digital technology

1. Moore's law is the observation that the number of transistors in a dense integrated circuit doubles approximately every two years

After almost four decades of exponential increases, the world now consumes an immense amount of processing power. In fact, according to Ray Kurzweil<sup>2</sup>, the computational power has already reached but a fraction of its ultimate potential. As per Kurzweil's predictions, by 2040 the power of computing is expected to exceed human intelligence (see Figure 1.4).

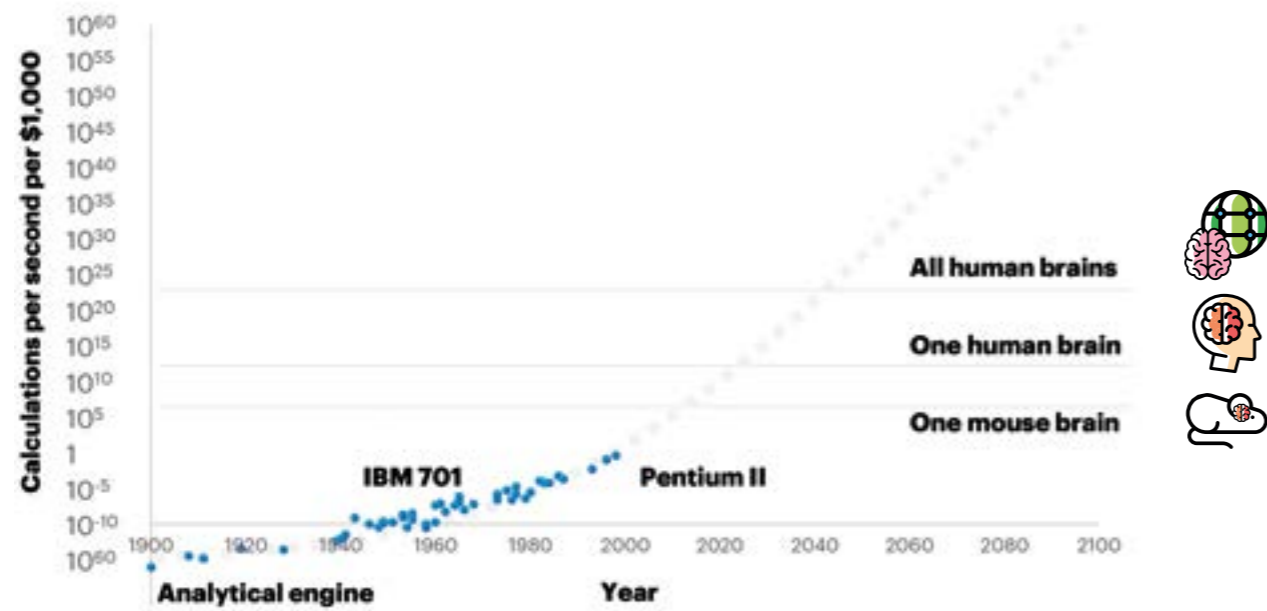


Figure 1.4. The exponential growth of computing

This is by itself an impressive fact that highlights the exponential growth of the computing power, which in turn leads to astonishing leaps forward with regards to technology. Technology is now integrated, omnipresent, cheap, and smart. It accelerates the world's movement to digital.

- **Cheap Computing & Storage:** The cost of advanced technologies is plummeting. Consider just one example: a top-of-the-range drone cost \$100,000 in 2007; in 2015 a model with similar specifications could be bought for \$500. As technology becomes cheaper, world demand is being met at lower price points.
- **Connectivity:** Technology is becoming more integrated. Connectivity has become the “king” in this new digital world, where we are all connected with everyone and everything. The possibilities are limitless: from fully automated cars, to “smart” homes and virtual offices. Connectivity points to faster more dynamic ways of doing business and has become the catalyst for advancements that will impact our lives at home, in leisure and at work. Ultimately, connectivity has the power to reshape our world.
- **Online Interfaces:** Technology is becoming omnipresent. Multiple digital touch points enable customers to interact and share their opinions anytime and anywhere. Customers are now always “on” and can constantly re-evaluate their options. Technology has made almost everything available at our fingertips.
- **Smart Devices:** Technology is becoming smarter. Sophisticated smart devices are now marketed “en masse” and better known as personal assistants by the names of Alexa, Siri and Cortana. In less than five years, basic queries such as “What is the time?” have quickly moved onto more sophisticated requests such as “Does the person I just talked to like me?”. Technology has been the multiplier.

2. In 1999, Ray Kurzweil formulated a set of predictions about information technology by constructing a graph of the computational speed growth over the next generations of information technology. Source: Kurzweil, R. *The Age of Spiritual Machines*. Penguin Books, New York, 1999

These rapid advancements have led to the emergence of a set of digital technologies, which are considered the “engines” of our digital future (see next page for a short description of digital technologies). And while each individual digital technology is a powerful means towards transformation, it is the combinatorial effect of these technologies that accelerates progress exponentially, allowing them to exceed their individual capabilities when deployed separately (see Figure 1.5). As the saying goes, “the pace of change will never be this slow again”.

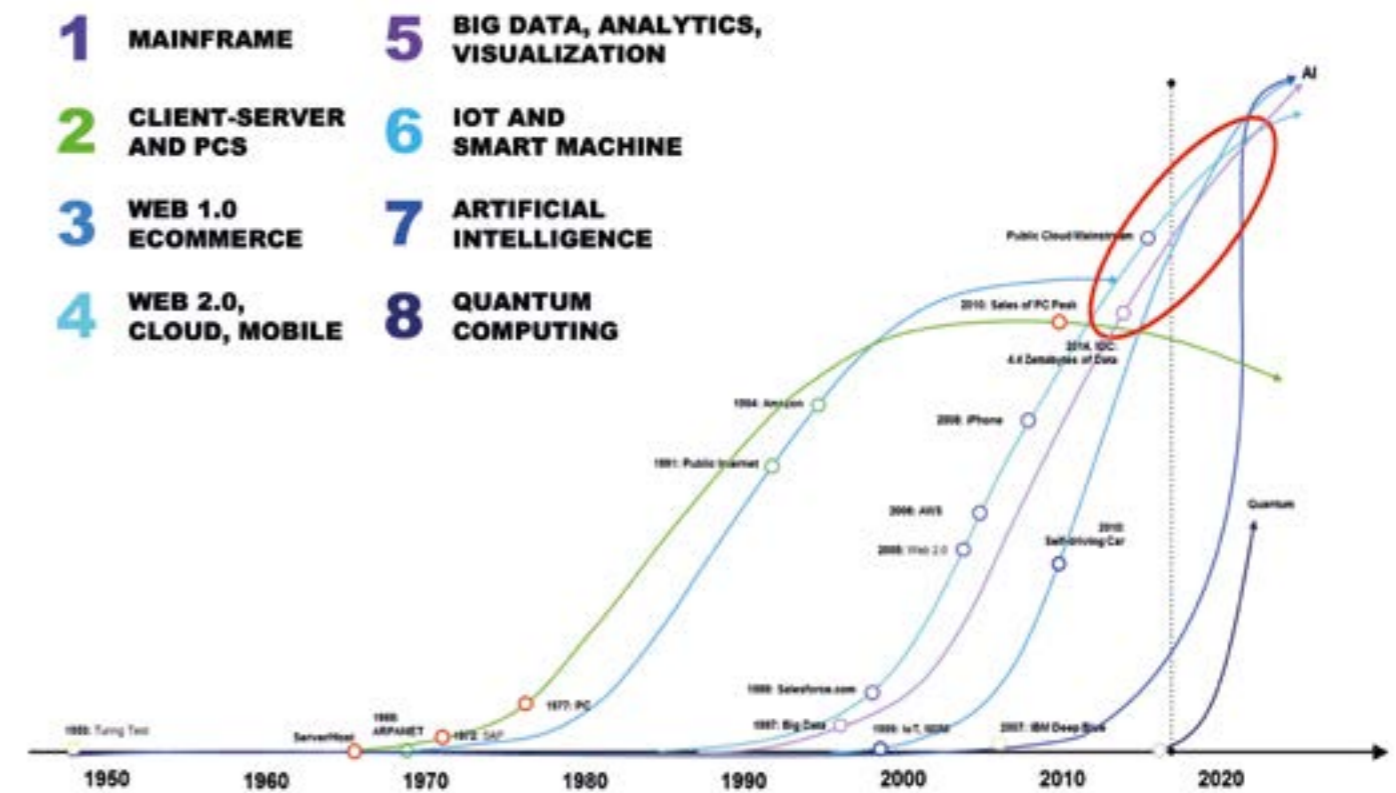


Figure 1.5. The convergence of technologies drives exponential growth

### Cloud Computing



The enablement of an on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned with minimal management effort

### Blockchain



Blockchain facilitates the movement of assets across the world in seconds, with only a minimal transaction fee. These assets can be any type of value, as long as they can be represented digitally



### Why Blockchain matters?

Blockchain is a distributed ledger system that stores groups of transactions (the “blocks”) and then links and sequences the list of transactions using cryptography (the “chain”, see Figure 1.7).

Blockchain provides digital information, which to date has been infinitely replicable, with provenance -which is why it is the basis for cryptocurrencies like Bitcoin. With blockchain, every piece of currency is trackable, and therefore valuable.

But blockchain is now being explored across a wide range of use cases, from identity management, to voting and smart contracts, with successful implementations radically transforming the way companies do business.

Essentially any business that could stand to benefit from an immutable database can and will be disrupted by blockchain. Some of the key blockchain applications are presented in the next page<sup>3</sup>:

### Virtual Reality



The provision of a computer-generated 3D environment that surrounds a user and responds to the individual’s actions in a natural way

### Big Data Analytics



The discovery, interpretation and eventual communication of meaningful patterns in vast amounts of data enabled by analysis tools and technologies

### Augmented Reality



The combination of real world and digital information in real-time using various computer interfaces

### Internet of Things (IoT)



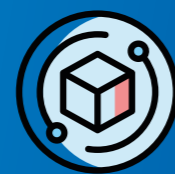
The network of physical objects that contains embedded technology to sense, communicate and interact with either the external environment or the object’s internal state

### Artificial Intelligence



The collection of multiple scientific disciplines, supported by technologies, which enable machines to sense, act and learn

### Quantum Computing



Quantum Computing promises to revolutionize the way computing is performed through the use of the most recent particle physics discoveries, in order to exponentially increase the capabilities of calculations

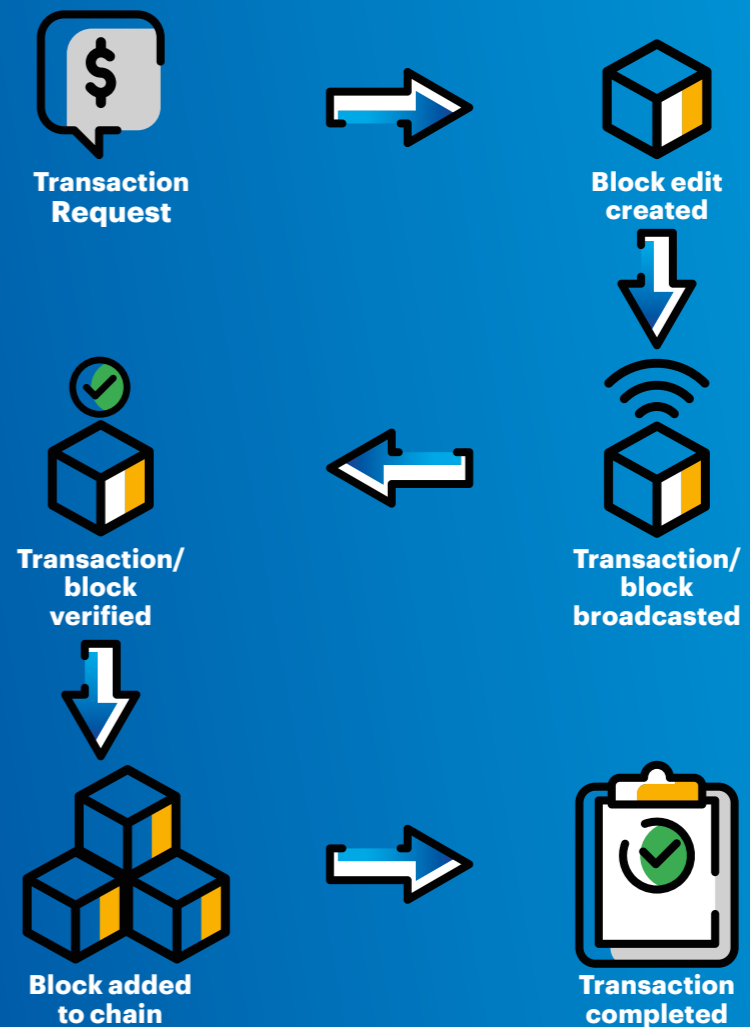


Figure 1.6. Digital Technologies - The “engines” of our digital future

Figure 1.7. How Blockchain works

3. Accenture, *Unlocking Trapped Value with Blockchain*, <https://www.accenture.com/us-en/insight-blockchain-business-value>



<b>Crypto currencies</b>	> A crypto currency (e.g. bitcoins) is a medium of exchange using cryptography to secure the transactions and to control the creation of new units. Crypto currencies are a subset of alternative currencies or specifically of digital currencies.
<b>Smart Contracts</b>	> Smart contracts are computer protocols that facilitate, verify, or enforce the negotiation or performance of a contract, or that obviate the need for a contractual clause. Smart contracts aim to provide security superior to traditional contract law and to reduce other transaction costs associated with contracting.
<b>Digital Signature</b>	> A digital signature is a mathematical scheme for demonstrating the authenticity of a digital message or document. A valid digital signature gives a recipient reason to believe that the message was created by a known sender, such that the sender cannot deny having sent the message (authentication and non-repudiation) and that the message was not altered in transit (integrity). The blockchain can be used to store encoded information about document digitally signed.
<b>Voting</b>	> A blockchain-based system might provide a useful way to prove that a particular vote was cast by someone with a specific private key, and thereby guarantee the integrity of the votes once they were cast.
<b>Identity Management</b>	> Blockchain can be used for the design of a simple process for anyone in the world to create their own Private Passport Service that can be used to validate and prove the existence of other persons using nothing but available tools (PGP encryption and blockchain).

# 1.3 DIGITAL REDEFINES INDUSTRIES

More than any technological revolution in history, the digital revolution has already proven its capacity to reshuffle the fundamentals of industries and to blur their boundaries.

The spread of digital and the declining cost of technology allowed companies to build products and services, which are simultaneously better, cheaper and customized. At the same time, it enabled new, disruptive, technology-driven companies to take over entire industries. This disruption often did not come from direct competitors in the same industry or even from companies with a remotely similar business model.

Digital disruptors leveraged scale and divergent business models to write off incumbents' positions of strength. Users/ buyers often made the switch in a matter of weeks. And it wasn't just the least profitable or "underserved" customers who were lured away. Consumers in every segment defected simultaneously-and in droves (see Figure 1.8).

<b>UBER</b>	<b>Transportation</b>	World's largest <b>taxi company</b>
	<b>Real Estate</b>	World's largest <b>accommodation provider</b>
	<b>Telecommunications</b>	World's largest <b>phone companies</b>
	<b>Retail</b>	World's most <b>valuable retailers</b>
	<b>Content</b>	Most popular <b>media owner</b>
	<b>Actual Inventory</b>	World's fastest <b>growing bank</b>
	<b>Entertainment</b>	World's largest <b>movie house</b>
	<b>Apps</b>	World's largest <b>software vendor</b>

Figure 1.8. Digital disruptors transform industries

What is also new and unprecedented about the current wave of digital disruption is the exponential rate at which this takes place.

We have grown accustomed to see mature products to be wiped out by new technologies and to ever-shorter product life cycles. But now entire product lines - whole markets - are being created or destroyed overnight. Disrupters can come out of nowhere and instantly be everywhere (see Figure 1.9).

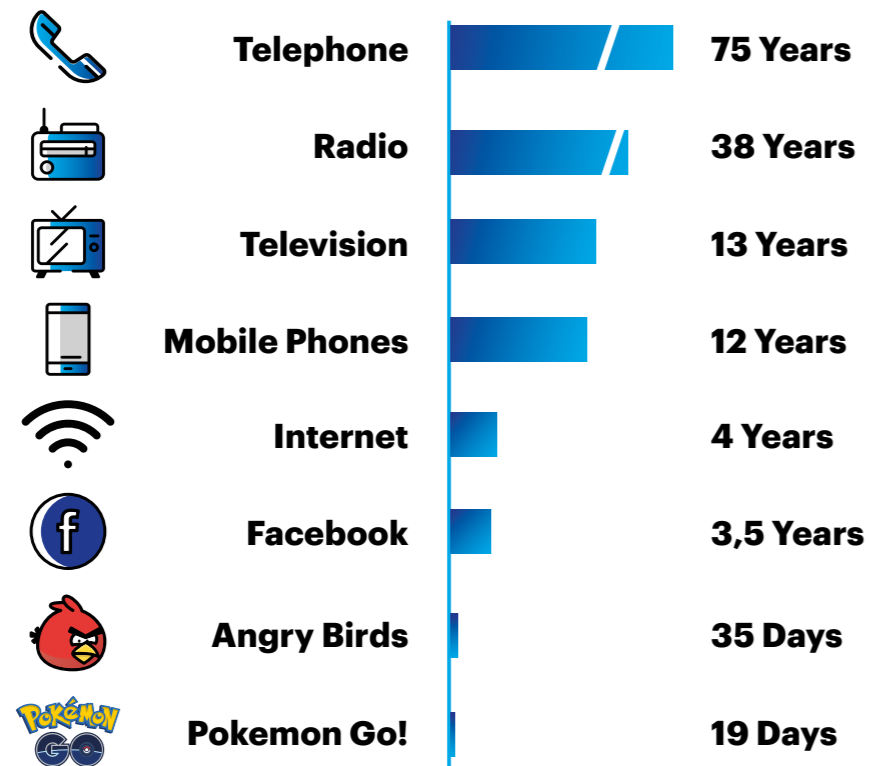


Figure 1.9. Time required to reach 50 million users

No industry is "immune" to the digital disruption. On the contrary, all industries are affected to a lesser or greater extent by digital. At the two polar extremes sit industries that either suffer a "big bang" disruption or are "compressively" disrupted.

## THE "BIG BANG" DISRUPTION

Back in the day, it was taking years or even decades for disruptive innovations to displace dominant products and services and destabilize the incumbent. More recently, businesses can be devastated virtually overnight by something better and cheaper. We call this type of devastating disruption, the "big bang" disruption. "Big bang" disruption has already become evident across many industries. The online advertising reached in approximately five years the same revenue level that it took printed newspaper advertising 25 years to reach (see Figure 1.10).

Navigation systems like TomTom have been wiped out by smartphones and free navigation applications. These game changers, the "big bang" disruptors bring fundamental changes and can make an entire industry disappear.

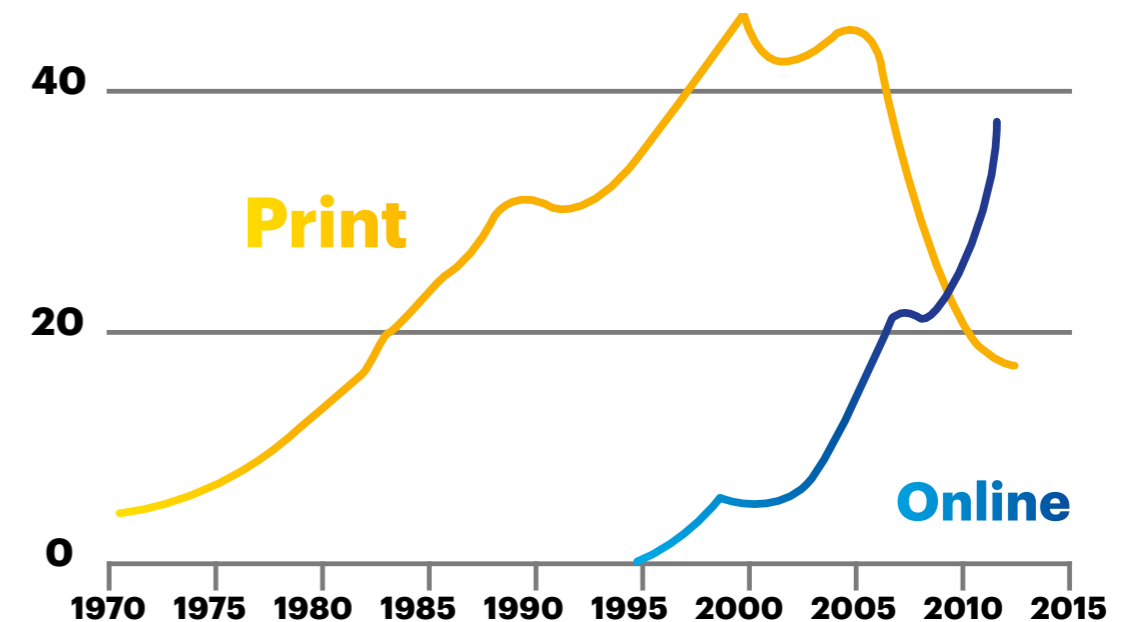


Figure 1.10. Big bang disruption-print and online media advertising revenue \$Bn

“Big bang” disruption begins with a series of seemingly random experiments, as innovators work with different combinations of component technologies and business models. Most experiments fail, giving incumbents the false sense that disruption is still far off. But when the right combination of technologies is paired with the right business model, take-off is immediate and market penetration is often nearly instantaneous.

In the age of the “big bang” disruption, disruptors come and go in relatively short blasts of market penetration and market saturation. The longstanding bell curve of market adoption, firstly introduced and popularized by Everett Rogers<sup>4</sup> is

no longer relevant<sup>5</sup>. When “big bang” disruptors take off they do so quickly, rising and falling looks less like a curve and more like a shark’s fin. Market adoption is now characterized by sudden, even “violent”, success, and then a short but brilliant period of dominance followed by dramatic decline, which prompts a new extension or enhancements to the product. This collapses Rogers’ classic bell curve of five distinct customer segments and replaces them with just two groups: trial users (who often participate in product development) and everyone else (see Figure 1.11).

### BIG-BANG MARKET SEGMENTS

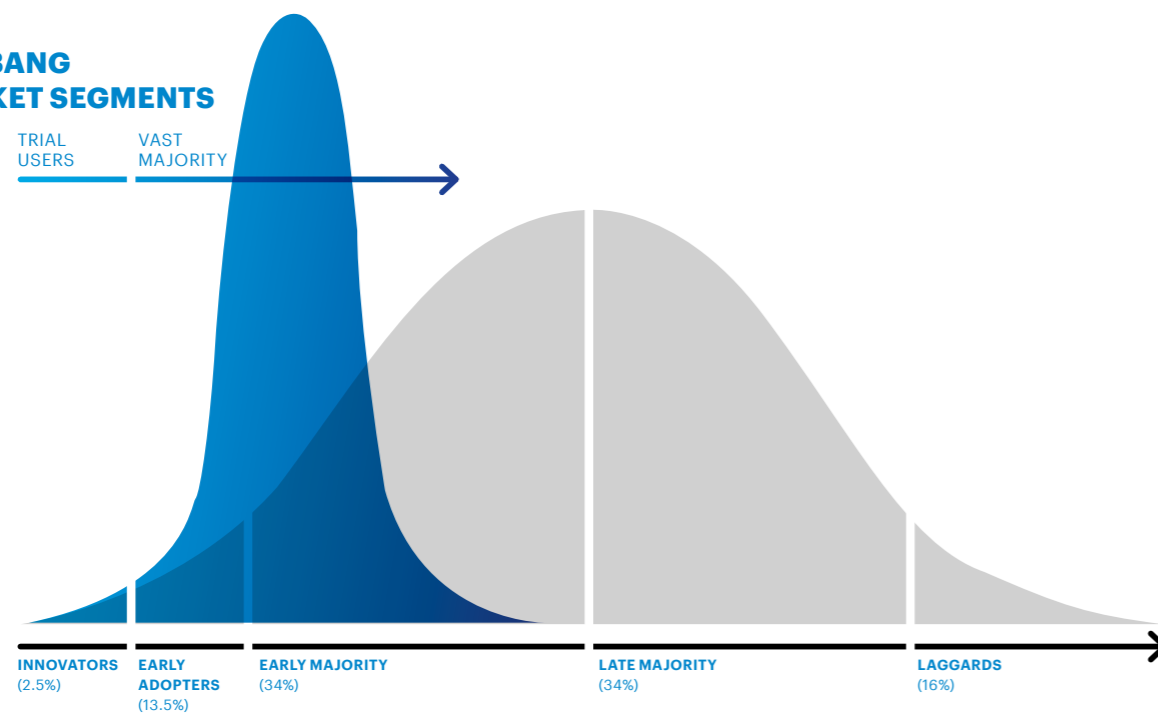


Figure 1.11. From the old to the new curve of market adoption of innovation

4. Everett M. “Ev” Rogers (March 6, 1931 - October 21, 2004) was an eminent American communication theorist and sociologist, who originated the “diffusion of innovations” theory and introduced the term “early adopter”.

5. Traditionally, a product or service lifecycle was represented by the traditional bell curve of market adoption of innovation. According to this curve, adoption gained momentum gradually by clearly defined market segments and sustained success over time. A pattern that allowed any number of players to grab a slice of the pie.

### The Case of the portable navigation tools

Mapmaking was a mature industry dominated by a few companies. Competition came first from free internet sites for route directions, such as MapQuest and Yahoo Maps. Then came stand-alone and in-dash devices that use GPS satellite data to generate real-time routes and turn-by-turn spoken directions. The big-bang disruption, however, turned out to be the smartphone, a device never intended to compete with traditional navigation aids. The Google Maps Navigation app, for example, offers virtually all the features of high-end GPS devices, and it costs nothing—it’s just another add-on for the free Android operating system. It has been installed on millions of smartphones and remains in perpetual “beta” release.

Google Maps Navigation competes with stand-alone GPS devices on all three value disciplines: It is clearly the cost leader. It is constantly being updated and re-released, making it the leading innovator as well. And by offering seamless integration with mobile phone contact lists, the web, e-mail, and apps such as Yelp, it likewise wins on the dimension of customer intimacy. No surprise, then, that after years of steady growth, the GPS device industry is in a tailspin. Garmin lost 70 percent of its market capitalization in the two years after navigation apps were introduced; TomTom nearly 85 percent.

Source: <https://hbr.org/2013/03/big-bang-disruption>

Larry Downes & Paul Nunes, “Big Bang Disruption,” *The Harvard Business Review*, March 2013

## THE “COMPRESSIVE” DISRUPTION

But not all industries have felt the same pace of disruption. When we analyzed exits from the S&P 500 between 2000 and 2015<sup>6</sup>, we saw that more than half came from just three industries: consumer products, information technology, and financial services. In other sectors, changes in the rise and fall of companies have been more gradual.

In fact, the most common and insidious form of disruption is the “compressive”. “Compressive” disruption is a form of disruption that is slower but just as dangerous as “big bang” disruption.

It is the compression of revenues and operating profits that occurs over a prolonged period of time and often becomes impossible to stop. The incumbent companies have a range of new entrants coming into their industry introducing new business models that “nibble” away at the edges of their profit streams. Key example of this is the computing device sector, where the rapid rise of the smartphones and laptops has compressed the operating profits of desktops, although the volume of desktops produced between 2005 and 2013 remained approximately unchanged (see Figure 1.12).

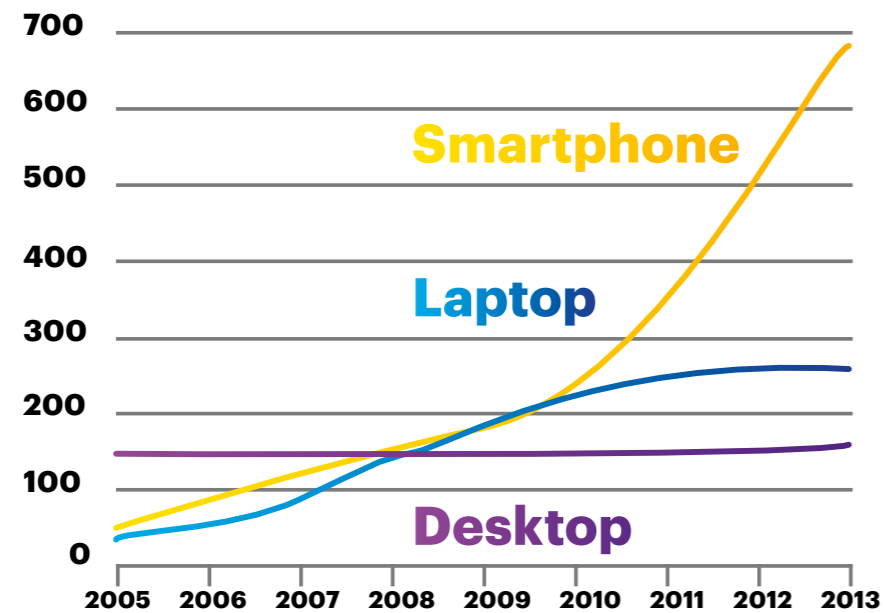


Figure 1.12. Compressive disruption-computing device shipments (#,M)

6. <https://www.accenture.com/us-en/insight-compressive-disruption>

Accenture research<sup>7</sup> indicates that the effects of this “compressive” disruption have been particularly felt within six industries, namely Automotive, Energy, Industrials, Materials, Telecommunications and Utilities, where a prolonged decline in revenues and operating profits is observed and appears to be unaffected by the economic recovery<sup>8</sup> (see Figures 1.13, 1.14).

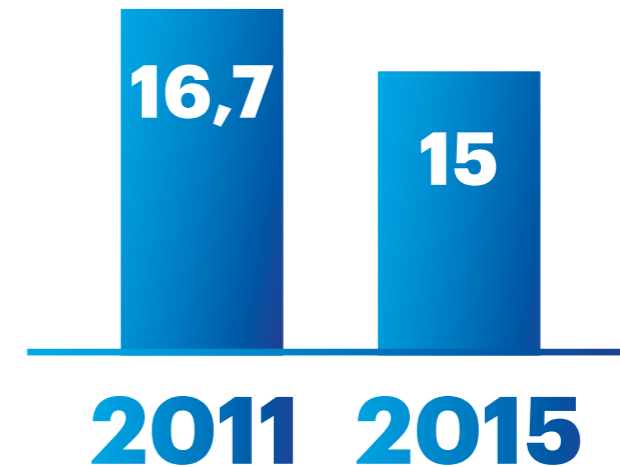


Figure 1.13. Aggregated revenues of six global industries (\$, trillions), 2011 - 2015

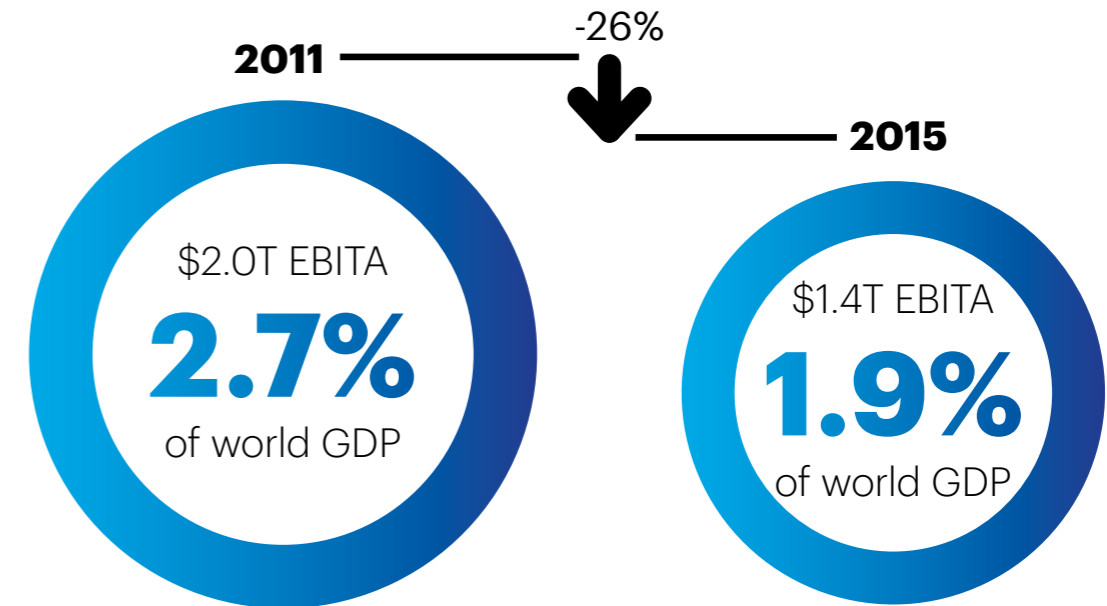


Figure 1.14. EBITA of six global industries (\$, trillions) 2011 - 2015

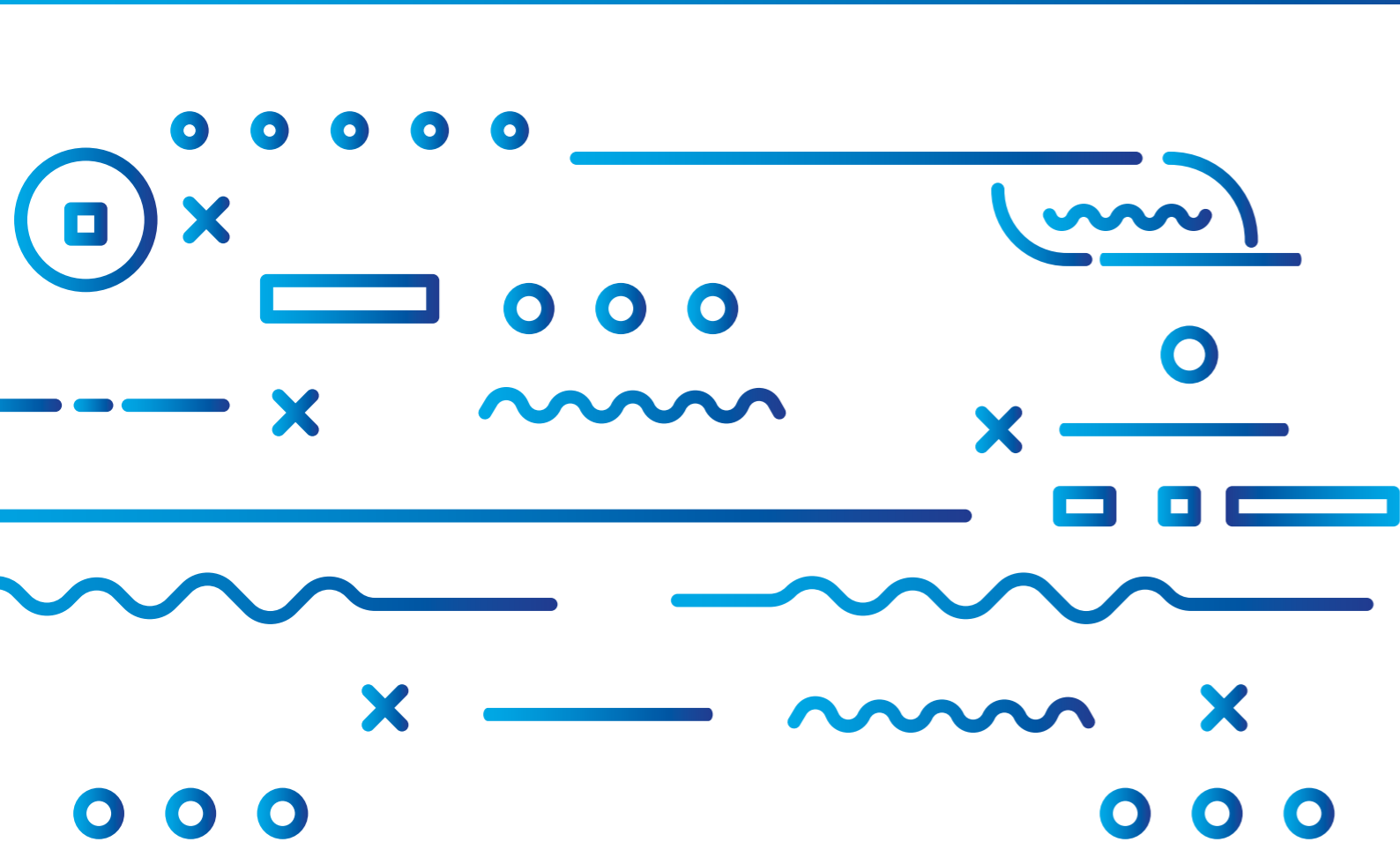
7. <https://www.accenture.com/us-en/insight-compressive-disruption>

8. Accenture analyzed the financial performance of more than 1,200 of the largest companies within six sectors from 2011 to 2015. Source: Accenture Profit Compression Database; World Bank national accounts data (current US\$); Accenture Research analysis

## The Shipping Industry Case

The substantial decline in the performance of shipping companies shows how quickly fortunes can change under myopic management. Despite sluggish growth in the wake of the 2008 recession, companies continued to invest in new, ultra-large vessels to boost scale and reduce slot costs. Executives expected the boom in international trade that preceded the economic crash to resume -but the flood of cargo never came. In the first half of 2016, eight of the 10 largest listed shipping companies reported EBITA losses. The third biggest, Hanjin Shipping Co. Ltd., based in Seoul, South Korea, filed for bankruptcy protection, leaving 66 ships carrying \$14.5 billion worth of goods stranded at sea in 2016. While this decline in performance has been driven in part by complex changes to demand and trade patterns globally, it is also the result of the companies' inability to identify the danger of compression and modernize for the digital age.

Source: <https://sloanreview.mit.edu/article/the-big-squeeze-how-compression-threatens-old-industries/>, A.P. Moller-Maersk, "Profits overboard," *The Economist*, Sept. 10, 2016, <http://www.economist.com>



# 1.4 DIGITAL DRIVES "LIQUID" CUSTOMER EXPECTATIONS

The digital revolution has dramatically changed customer expectations. As customers, we expect to have our needs addressed anytime, anyplace, via any channel, at our fingertips. We now have more information than ever and therefore we can better control the "when", the "where" and the "how" we interact with brands. From browsing and purchasing, to usage and disposal (see Figure 1.15)<sup>9</sup>.

Today's customers are significantly different from the recent past. Our expectations as customers today have become "liquid". In simple words, our expectations now transcend traditional industry boundaries. We expect a similar quality of experiences across all products and services we consume. Companies such as Airbnb and Amazon set the bar for the experience that we would like to receive from any company we interact with.

## Today Customers:

### Are highly informed



**20%**

of smartphone owners use their phone to help with shopping

### Trust the crowd



**4:1**

shoppers prefer online ratings to advise from store employees

### Are socially connected



**30%**

of mobile time is spent on social media accounts

### Look for instant gratification



**57%**

of customers are likely to abandon an online purchase if a question is not immediately forthcoming

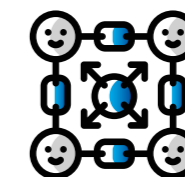
### Are price sensitive



**64%**

of people will go 5-10 minutes out of their way to secure a better price

### Are Self-Promoting



**2,5Bn**

Facebook content shares per day

Figure 1.15. : Traits of the new "digital customer"

9. Accenture's Global Consumer Pulse Research 2014, 2015, 2016

While digital has become increasingly important to all of us, different groups of customers embrace it with a variable zest. In fact, as per Accenture's research<sup>10</sup>, some customers, the "digital savvy", have completely "gone digital" - they prefer to interact via online channels at every opportunity. At the opposite end of the spectrum, we find customers who still rely on "traditional" channels, but even they are likely to selectively use the available digital channels.

Located in-between, we position the "transitional" and "experimental" customer types, who differ in how they interact with digital. "Transitional" customers incrementally and selectively leverage digital channels to improve their overall experience, while "experimental" customers broadly use digital as their preferred way of interaction, without always achieving this (see Figure 1.16).

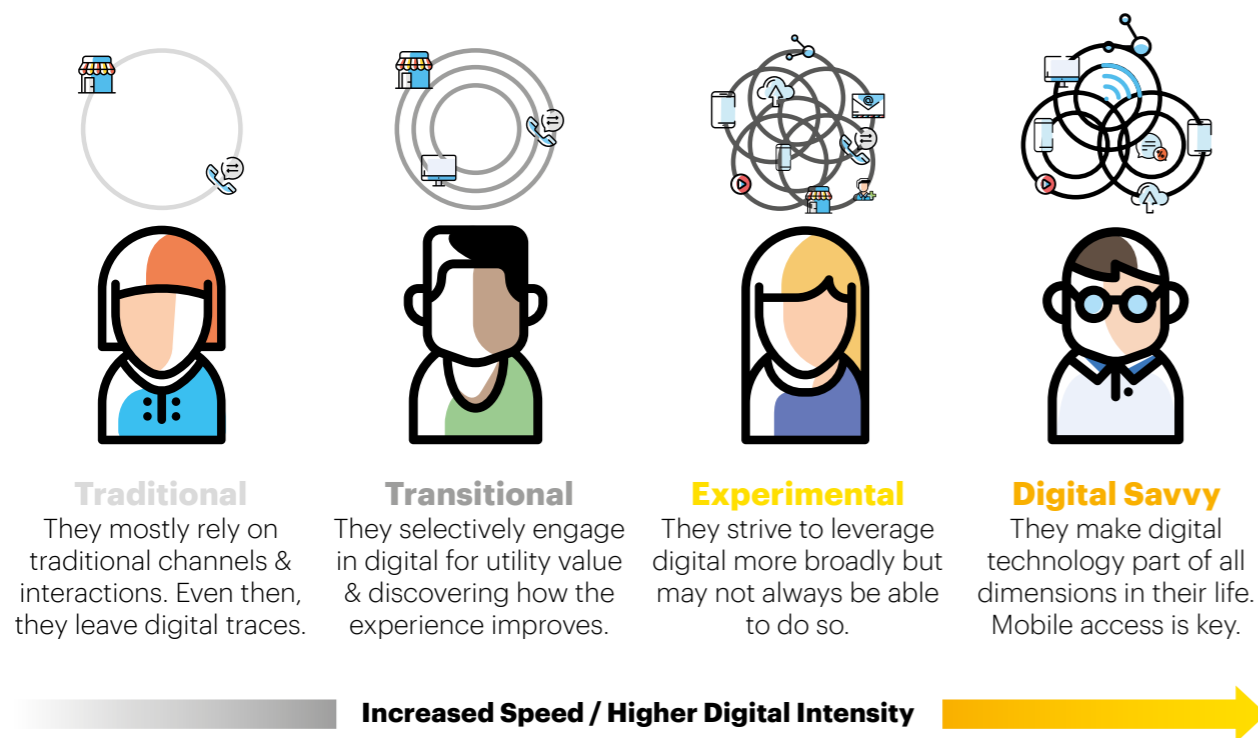


Figure 1.16. The four types of the new "digital customer"

Many would simply generalize this as a millennial phenomenon, but this would be too simplistic. Our research showed that customers between the ages of 18 and 34 years are two to three times more likely to use digital.

However, we also observed that the older group appears to be surprisingly open to add new digital channels to their portfolio and experiment with online interactions.

10. Accenture's Global Consumer Pulse Research 2014, 2015, 2016

In this context, we observe that customers and companies have created a new consumption paradigm that revolutionizes both the "what" and the "how" of consumption (see Figure 1.17).

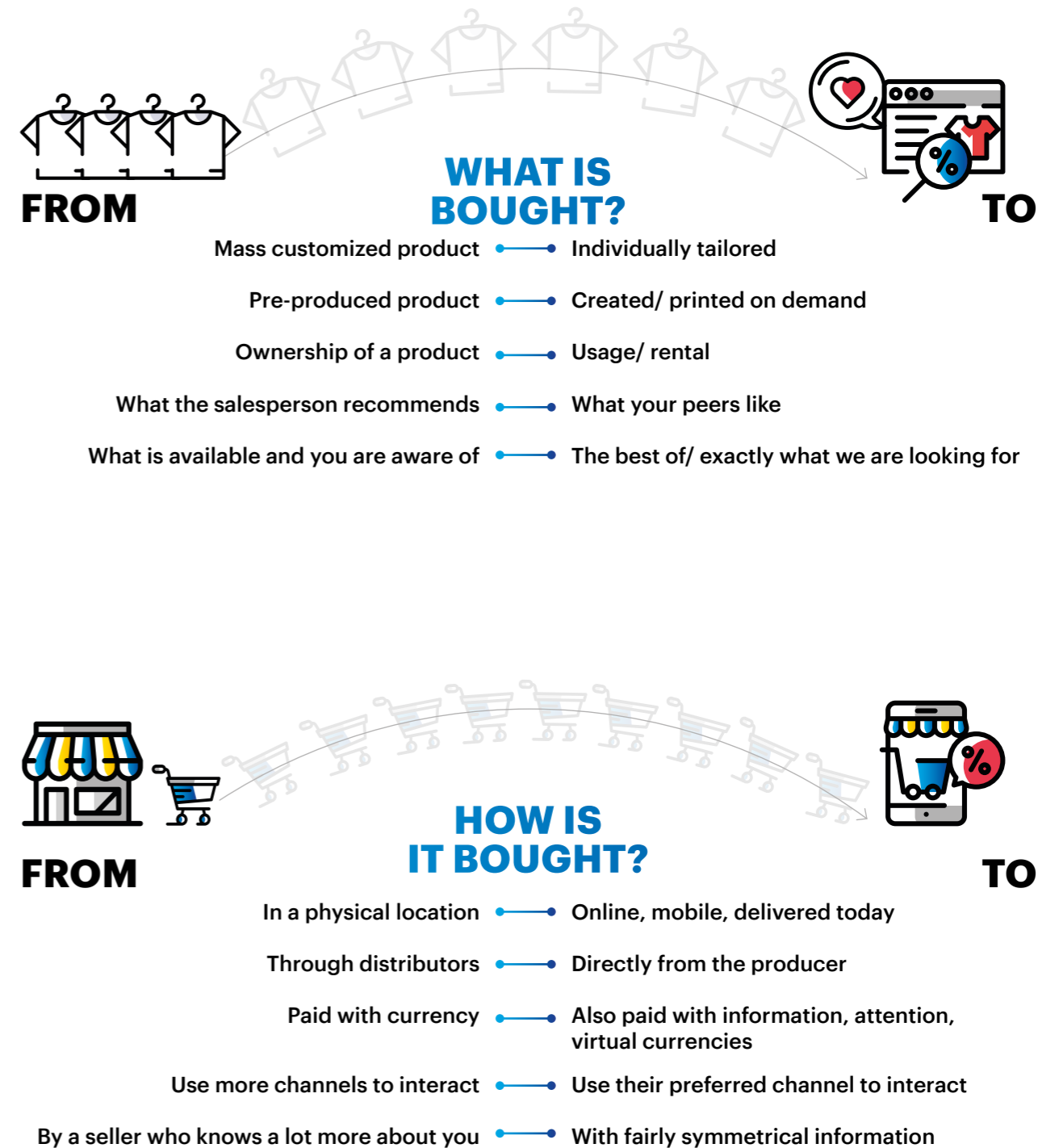


Figure 1.17. The new consumption paradigm

In the near past, products were well-defined, mass produced and fully owned. Companies directed what we bought through influential marketing and advertising initiatives. Today, there is a marked shift in what we buy. Products can be heavily customized and personalized. We can choose where and when to consume our products and our buying decisions are greatly influenced by online reviews, instead of the pre-defined marketing campaigns.

This new breed of customers often prefer to share or even rent/ hire the products and services they consume. They also seek instant gratification, use their mobile devices to order and prefer to have them delivered on demand.

To meet these changing customer expectations and tap into new revenue streams, it is now more important than ever for companies to embrace digital both as a catalyst and as an enabler that will radically transform their organizations and allow them to rotate to the "New".



### Emirates NBD: The New Customer Experience for the Connected Age

Emirates NBD wanted to accelerate the development of next generation digital and mobile banking services, in order to increase smart service adoption in the UAE. Allen International, now a part of Accenture, came in to help them bring to life this key initiative of their digital strategy. Together, Emirates NBD and Allen International established an innovative digital branch called Future Banking Lab. The latter incorporates both physical and digital designs into three seamlessly connected zones:

- > **The Digital Banking Zone:** This zone provides convenient self-service banking facilities where customers can use Intelligent Tellers Machines (ITMs) providing video connections to remote service staff should they require assistance with any of their daily transactions.
- > **The Future Banking Zone:** A 'Future Banking' lab is the first of its kind in the UAE. In this space Emirates NBD showcases digital innovations developed with technology partners such as the Visa 'Connected Car', MasterCard 'Virtual Shopping Experience' and SAP's 'Augmented Reality Real Estate and Mortgage Digital Solutions'. This changing interactive exhibition space will provide a lab environment for customers to trial and collaborate in the development of innovative products and services prelaunch to the UAE market.
- > **The Relationship Zone:** The heart of the space and Emirates NBD offer is the consultation area of the branch. A contemporary design provides a relaxed environment for customers to browse the bank's products and services and meet one to one with Emirates NBD's financial advisors. A quick service desk provides an immediate location for customers to make enquiries or resolve problems, whilst the interactive lounge presents tailored digital apps and online/mobile banking demos, to inform and entertain the customer whilst they wait.

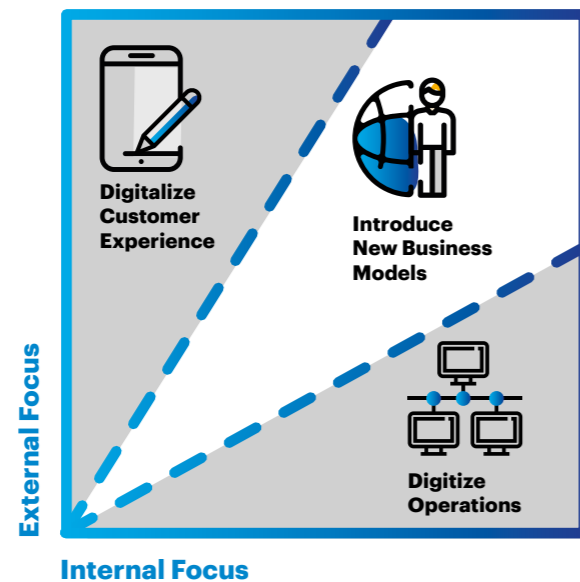
Since the successful launch of the futuristic Emirates Towers branch, Allen International has received very positive initial customer/visitor feedback through the survey conducted by lobby managers:

- > Overall Emirates Towers visit satisfaction (mean) score is **8.8**
- > **93** percent of customers are likely to recommend Emirates NBD to their friends/ family.
- > **79** percent of visitors (Non-Emirates NBD) are likely to open an account with Emirates NBD based on their visit experience.

Source: Ng, Zhi Ying. "Case Study: How Emirates NBD Bank Connected Execution To Strategy." Forrester, 26 July 2017 [www.forrester.com/report/Case+Study+How+Emirates+NBD+Bank+Connected+Execution+To+Strategy/-/E-RES131664](http://www.forrester.com/report/Case+Study+How+Emirates+NBD+Bank+Connected+Execution+To+Strategy/-/E-RES131664)

# 1.5 DIGITAL TRANSFORMS OPERATING MODELS

Industry convergence, combined with the constantly evolving customer expectations require businesses to look outside their “walled” structures and to redefine their purpose. This unequivocally demands a comprehensive change in each component of their operating models; how they are organized, which processes are automated, what talent they need and to which ecosystems shall they become part of (see Figure 1.18).




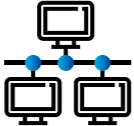

<p><b>1</b></p>  <p><b>Digitalize the Customer Experience</b></p> <ul style="list-style-type: none"> <li>&gt; Offer end-to-end propositions covering every aspect of a customer’s experience</li> <li>&gt; Create Differentiated Services to foster long-term loyalty</li> <li>&gt; Understand Real-time behaviors to personalize products</li> <li>&gt; Connect at every stage of the customer journey</li> </ul>	<p><b>2</b></p>  <p><b>Digitize Operations</b></p> <ul style="list-style-type: none"> <li>&gt; Digitize Functions and build intelligence into processes</li> <li>&gt; Maximize Supply chain, HR, Finance efficiency, etc.</li> <li>&gt; Embed Smart Assets with IoT, Automation, Connectivity and Intelligence</li> <li>&gt; Adopt intuitive connected Tech to empower employees</li> </ul>	<p><b>3</b></p>  <p><b>Introduce New Business Models</b></p> <ul style="list-style-type: none"> <li>&gt; Redefine Business Strategy and Models for Growth</li> <li>&gt; Join ecosystems and flex to the Changing Landscapes</li> <li>&gt; Develop new sources of value</li> <li>&gt; Use digitization savings to fuel growth</li> </ul>
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Figure 1.18. Companies should focus both externally and internally to become “digital enterprises”

# COMPANIES DIGITALIZE THEIR CUSTOMER EXPERIENCE - “GO DIGITAL”

The need to provide a customer experience that competes within and outside of the industry core, leaves businesses with plenty to think about. Companies strive to become more customer-centric and to offer innovative and personalized products and services. Next to the highly customized products we see companies to experiment in giving away their core product for free, in order to monetize services and drive revenues over the lifetime of their customers (for cross-industry examples see Figure 1.19).







 <p><b>Oil &amp; Gas</b></p> <p>Use of real-time survey software and data to provide directional drilling analysis enabling engineers to optimize drilling trajectory and avoid costly accidents (e.g. Halliburton Landmark)</p>	 <p><b>Pharma</b></p> <p>Use of sensors and digital services to provide tailored 24/7 drug administration care by constantly monitoring and providing feedback on a patient’s condition</p>	 <p><b>Automotive</b></p> <p>Car-as-a-service enabling consumers to use a vehicle or transportation in a vehicle, on an as-needed or as-consumed basis (i.e. GM via investment in Lyft)</p>
 <p><b>Energy</b></p> <p>Use of sensor-enabled LED lighting to help consumers realize potential opportunities for value (e.g. GE Lighting’s gunshot detection technology for cities)</p>	 <p><b>Health Care</b></p> <p>Companies that used to sell you hardware to perform a test are now looking to manage the results of the tests and provide analytics-based health care based on a personal electronic health record.</p>	 <p><b>Industrial</b></p> <p>Use of software to communicate, diagnose and service electronically controlled engines and machines. (e.g. Caterpillar Electronic Technician)</p>

Figure 1.19. The “Everything-as-a-Service” trend

At the same time, other brands like Nespresso are employing the latest technologies not just to create a captivating digital experience, but to also harness their digital prowess and to enhance the customer offering, both in the digital and physical worlds.



### Case Study - Nespresso

Nespresso heavily invested in creating an innovative and transformative experience for its customers. The company's focus was to enable simple digital transactions, drive personalization and customization across channels, leverage digital media to craft and deliver a compelling brand, and blend digital and physical for a meaningful omnichannel experience. Nespresso is all about consumer's experience, not just the product. Unlike the grab-and-go culture of Dunkin' Donuts and the creative coffee lounge Starbucks fashions itself to be, Nespresso is meant to be enjoyed slowly and luxuriously in the comfort of your own house. Everything about the brand is aimed to provide a unique, personalized experience. Nespresso makes it extremely easy to get its products to your home with a seamlessly designed e-commerce experience that competes with some of the best retail experiences in any vertical. Following a simple process on the web or in Nespresso's mobile app, users ("Club Members" as Nespresso refers to its most loyal customers, thus reinforcing its luxury status) can order the brand's products that will be delivered anywhere in the U.S. in just two days. User's order history is retained in order to facilitate any new orders. This simple reorder is just the beginning of Nespresso's shrewd data strategy that enables user personalization and customization across all Nespresso channels.

Nespresso leverages a cloud-based customer engagement solution that analyzes all customer data-web and app orders, in-store orders, behavioral analytics, and interactions with Nespresso kiosks-into one unified single customer view. The advantage of this transformative experience is that it's not limited only to its digital touchpoints. The brand's experience design extends beyond its mobile application and website to a seamless in-store experience. Nespresso invests in its physical locations, which calls "boutiques", by carefully selecting the actual location, and artfully design it with luxurious leather, wood, and glass, thus creating an upscale brand value proposition.

Source: <https://centricdigital.com/blog/digital-trends/digital-transformation-at-nespresso/>

## COMPANIES DIGITIZE THEIR OPERATIONS - "BE DIGITAL"

As the pace of change accelerates, the continuous exploitation of data sources becomes vital for companies. Digital companies adopt a data mindset and build the respective analytical capabilities to distil business insights and make actionable decisions at optimal speed. In fact, a recent study of 179 companies, led by an economist at the MIT Sloan School of Management, suggests that companies that adopted "data-driven decision-making" have productivity levels 5 to 6 percent higher than can be explained by other factors, including investment in technology<sup>11</sup>.

In order to transform to insight-driven organizations, companies are embracing a new

set of capabilities and radically change the way they function. Designing for data analytics is more than simply adding a few data requirements to a software development cycle or an RFP; it is about implementing an enterprise-wide data strategy. This enables:

- ▶ the consolidation of all available data sources to ensure a "single version of truth"
- ▶ the removal of organizational silos that prohibit the seamless cross-functional flow of data
- ▶ the onboarding of advanced analytics capabilities for the elicitation of actionable business insights

### myBBC

In March 2015 the BBC Director-General noted the broadcaster was "at the start of a real transformation" - to adapt to broadcasting in the Internet age. His vision was to create a platform that could use the power of data to deliver true personalization for online users, and the power of analytics to inform decision making for editorial and creative teams. BBC collaborated with Accenture to deliver the myBBC platform, a portfolio of authenticated online services and products, designed to engage audiences across multiple devices. The platform supports the BBC's goals for delivering new data-driven features, products and services. In addition, it sheds light on audience activity, helping transform the way people find, view and interact with the content.

MyBBC has truly transformed the BBC's operating model. It has elevated them from a traditional broadcaster into a leading digital organization - one capable of continually learning about its audience and delivering more relevant content and a better viewing experience as a result. What's more, over a third of the BBC's 6.4m users sign in on a monthly basis, across multiple devices, getting a personalized, connected experience with the content they love. In the last quarter of 2015, these signed-in users consumed 44 percent more BBC content than those who weren't signed in.

Source: [https://www.accenture.com/t20170417T003136Z\\_w\\_us-en/\\_acnmedia/PDF-42/Accenture-CSB01344-BBC-Security-Credential.pdf](https://www.accenture.com/t20170417T003136Z_w_us-en/_acnmedia/PDF-42/Accenture-CSB01344-BBC-Security-Credential.pdf)

<sup>11</sup> Erik Brynjolfsson, Lorin M. Hitt, and Heekyung Helen Kim, "Strength in Numbers: How Does Data-Driven Decision making Affect Firm Performance?"

In “digital enterprises”, linear processes are “dying” and the walls come down between silos so the business can work collaboratively, and in new ways. Companies are required to be more flexible and fluid so that they can organize around customer outcomes. Traditional capabilities will still have a home in “digital enterprises”, but not in discrete functional silos. Capabilities are now becoming modular. These capability “blocks” can be stacked together to deliver a desired customer outcome and solve the challenges of the moment. Similarly, they can be dismantled and reconfigured to achieve a different customer outcome (see Figure 1.20).

At the same time, technological innovation and more specifically the implementation of Robotics Process Automation (RPA) provides dramatic improvements in process automation and optimization, leading to increased operational efficiency and accuracy. On the surface it may appear that RPA is a simple transfer of tasks from man to machine. However, a closer look reveals that the real power of RPA lies in its ability to fundamentally change traditional ways of operating, for businesses and individuals alike. This technological innovation offers scale, speed, and the ability to cut through complexity invigorating the workplace and is changing the rules of what’s possible.

## COMPANIES INTRODUCE NEW BUSINESS MODELS

In this digital world where industry boundaries are permeable and digital technologies accelerate the pace of change, every business must reconsider its overall strategy. Instead of trying to be an expert at everything, companies need to become open by default. In fact, in this increasingly complex competitive landscape, businesses must develop a strong ecosystem of partners stretching across the value chain if they are to generate new forms of growth. Market leaders recognize the need to participate in such ecosystems.

Over 70 percent of research respondents said they would be increasing their partnerships and alliances as they attempt to boost digital growth in the next three years<sup>12</sup>. More than 40 percent of them claim that their organizations’ engagement in ecosystems will be extremely critical to future business success<sup>13</sup>.

Companies increasingly integrate their core business with third parties, shaping digital ecosystems and unlock new waves of growth. An ecosystem can extend a company’s footprint and amplify its market share, giving the associated company a competitive edge. Ecosystem partners help overcome limitations of internal resources to build new solutions and scale business.

An emblematic example of an ecosystem play can be the automotive industry. Nowadays, major manufacturers build “connected” cars. The technology in the connected cars is fueling a rich ecosystem that is becoming the next major hub for innovation. Companies across industries join this ecosystem and offer a wide array of digital services. Such services are: mobile hot spots, remote diagnostics, safety and security, infotainment, variable insurance, car sharing, and much more. This digital ecosystem is redefining what automakers do. Rather than just building cars, they now engage with customers throughout the vehicle lifecycle, directly manage software upgrades, diagnostics, and car/passenger/ citizen safety.

But, changes aren’t limited to the automotive industry. As the ecosystem matures, it becomes the foundation for more widespread disruption.

For example, the telematics data from connected vehicles transforms the way businesses optimize their supply chains -reinvents logistics and reduces costs with real-time asset tracking and on-time delivery. It is also becoming an integral piece of smart cities- enabling local Governments to start developing advanced services, from smart traffic monitoring to road planning and energy management.

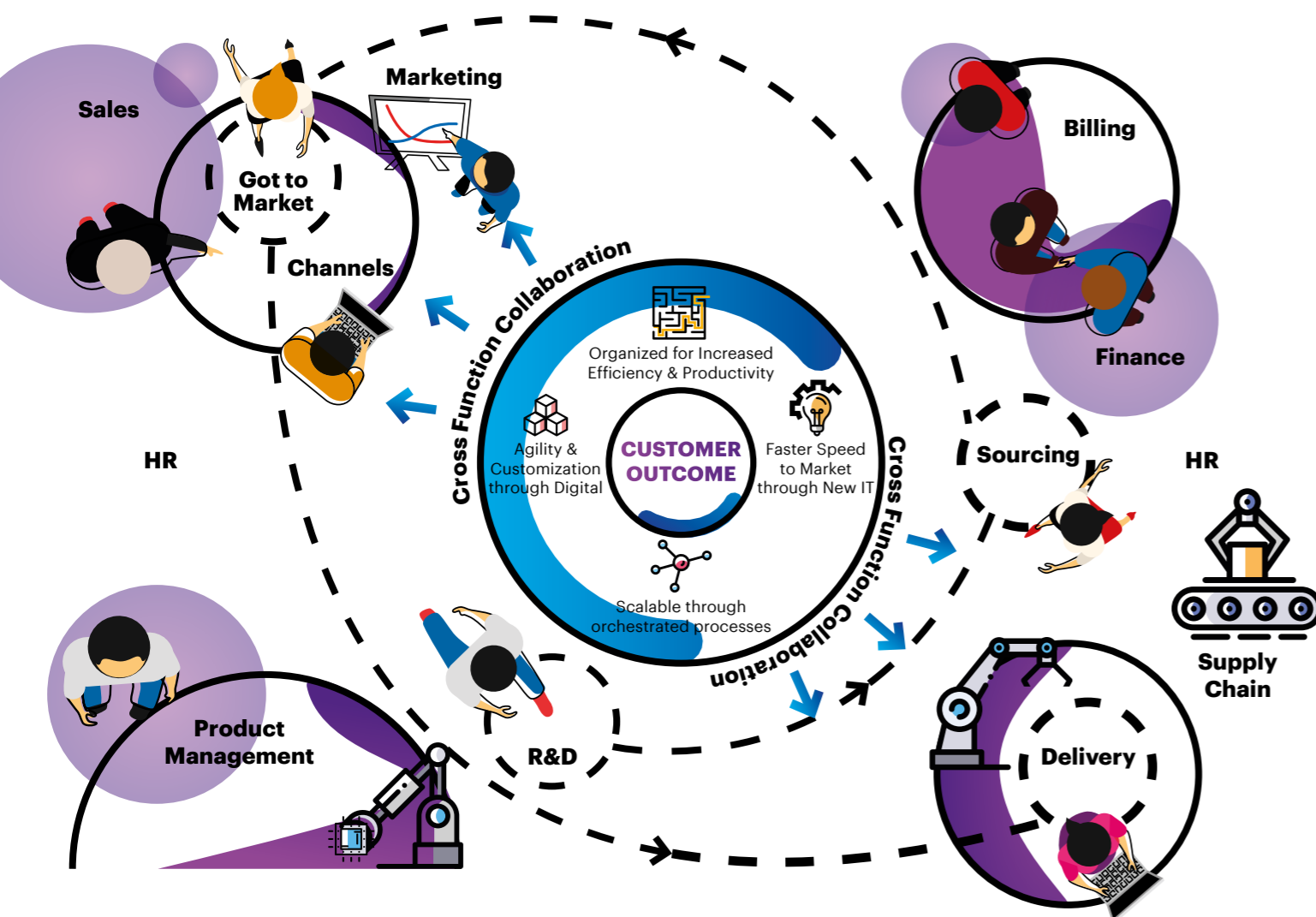


Figure 1.20. Processes oriented around customer outcomes

12. “Being Digital: Seven no regret capabilities”, Accenture, 2015  
 13. Accenture 2017 CXO Survey, Accenture Technology Vision 2017

Similarly, in the insurance industry pulling down driving data from connected car platforms has enabled new services such as pay-per-mile insurance with newcomers like Google and Metromile to challenge the industry status quo. With driverless cars becoming a reality within just a few years, pay-per-mile is providing a glimpse into the imminent disruption in consumer transportation.

#### UBER - The UberHEALTH Platform

The company started by building a mobile device platform to create an ecosystem of connected cars and drivers that disrupted the taxi industry. As this foundation has settled, Uber now uses that same ecosystem to push disruption into new sectors- such as the recent trial of UberHEALTH in Boston. With its existing network of cars and customers, and a new set of skilled workers - registered nurses - Uber has been able to provide on-demand delivery of flu shots and similar vaccinations. Neither hospitals nor major pharmacy chains in the United States would have ever previously seen Uber as a competitor.

Source: <https://newsroom.uber.com/us-illinois/uberhealth-in-boston-3/>



As the abovementioned example shows, the disruptive nature of these new digital ecosystems is not bound by traditional industry barriers. As every industry becomes digital, an ecosystem forming in one sector can rapidly become the foundation for disruptions in another.

## 1.6 DIGITAL DEMOCRATIZES WORK

Popular culture has long promoted a man-versus-machine view, where intelligent machines were perceived as a potential threat for replacing humans and taking over their jobs.

On the contrary, digital technologies significantly amplify the workforce's skills, radically augment brain and brawn to enhance both the cognitive and collaborative side of work and democratize how work is conducted.

However, this is a misguided view. Digital is not eliminating the need for humans in the workplace.

## DIGITAL REDEFINES WHAT WORK IS PERFORMED

In the early days of digital, technological advances were associated primarily with efficiency. Taking human intervention out of work and replacing it with automation changed the very foundations of how work was performed.

Workers collaborate with embodied robots and exoskeleton suits to augment their physical work and perform precise, arduous or routine physical work<sup>14</sup>.

Now, through the combinatorial effect of emerging technologies digital redefines the notion of jobs and dramatically augments human capabilities. Big data analytics provides the workforce with the ability to process and analyze vast amounts of data from myriad sources. AI virtual assistants, i.e. Siri, Cortana & Alexa, employ advanced interfaces such as voice-driven, natural-language processing to facilitate interactions between people or on behalf of people.

Accenture research indicates that organizations have been making more investments in analytics capabilities and AI-related technologies over the last two years - 41 percent of organizations are making considerable investments in analytics capabilities/ tools and are planning to continue investments in the next 1 - 2 years<sup>15</sup>. 77 percent of them are already investing in deep learning as well as embedded AI solutions<sup>16</sup>.

14. *Human + Machine, Reimagining Work in the Age of AI*, Paul R. Daugherty, H. James Wilson

15. *Accenture Volatility and Agility Study, 2014*

16. *Accenture Technology Vision, 2016*

### Mercedes - Benz

Mercedes - Benz plant in southwest Germany processes fifteen hundred tons of steel a day, pumping out more than four hundred thousand vehicles a year. Despite these numbers Mercedes has ditched its robot-dominated assembly line and redesigns its processes to center them around people. The driver for this change is the rise of customizable cars. Customers are now able to go online and choose from an expansive set of features for their next car. With so much variation in car manufacturing, the only way to assemble cars fast enough is to bring people back. "We're moving away from trying to maximize automation, with people taking bigger part in industrial processes again" says Markus Schaefer, head of production planning at the Mercedes. "When we have people and machines cooperate, such as a person guiding a part-automatic robot, we're much more flexible and can produce many more products on one production line. The variety is too much to take on for the machines."

In the Mercedes - Benz factory, a new breed of "cobots" is now enabling people and robots to work side by side or in collaboration. These cobots are built with smart software that learns over time and sensors that allow them to adapt to the situation at hand and be responsive to people. Cobots take on repetitive and precision tasks as well as heavy lifting, while a person brings the brains and dexterity to the operation. Cobots, in this way, are literally extending the workers' physical capabilities.

Source: "Meet the cobots: humans and robots together on the factory floor," *Financial Times*, May 5, 2016. <https://www.ft.com/content/6d5d609e-02e2-11e6-af1d-c47326021344>

At the same time, digital technologies overhaul and "reimagine" traditional job roles and re-write job descriptions. In many industries and countries, the most in-demand occupations or specialties did not exist ten or even five years ago. By one popular estimate, 65 percent of children entering primary school today will work in jobs that currently have not been invented<sup>17</sup>.

Digital advances may indeed displace certain types of work<sup>18</sup> (see Figure 1.21). Typically, highly repetitive, predictable and transactional activities are the prime candidates. At the same time, new types of work will be created, leveraging unique human capabilities like empathy, emotional intelligence, judgment, creativity and complex problem solving.



Figure 1.21. Jobs most & least at risk of digitalization

17. McLeod, Scott and Karl Fisch, "Shift Happens", <https://shifthappens.wikispaces.com>

18. Source: "The Future of Employment: How Susceptible are Jobs to Computerization?" Oxford University, 2013

These new jobs will redefine our relationship with “work” in a more positive and socially beneficial way<sup>19</sup>.

For one, the increasing importance of user experience in digital products and services may potentially give rise to a new class of C-suite executives, the Chief Experience Officers. The rise of Augmented Reality offerings can potentially create employer demand for Augmented Reality Architects. The technological refinement of medical services, and surgery in particular, may introduce a new type of medical professional, the Telesurgeon.

The latter will require medical as well as technological expertise, and the ability to effectively control surgical machinery. Furthermore, the growing trail of data created by the digital age is likely to introduce the Digital Archeologist, whose capabilities for searching and recovering old data from legacy systems will be a useful service to future data-oriented enterprises.

In such a rapidly evolving employment landscape, the ability to anticipate and prepare for future skills requirements is increasingly critical for businesses and Governments alike. This is a key challenge for the success of their digital transformation. According to Accenture research, when asked to name the top challenges their companies need to overcome to succeed, “acquire, develop and retain digital talent” was the top response<sup>20</sup>. At the same time, digital trends bring about an unprecedented rate of change in the core curriculum content of many academic fields. Nearly 50 percent of subject knowledge acquired during the first year of a four-year technical degree is outdated by the time students graduate<sup>21</sup>.

According to the World Economic Forum and their latest study on the future of jobs<sup>22</sup>, manual skills and physical abilities, as well as management of financial and other resources appear to fall in demand. On the other hand skills like analytical thinking, innovation and active learning will continue to grow in prominence by 2022. Skills such as technical design and programming are increasing in importance (see Figure 1.22).

## DIGITAL REDEFINES HOW WORK IS PERFORMED

Digital is shaking the foundations of labor management to its core as functional roles and rigid job descriptions give way to people coalescing around joint goals to be delivered via collaborative teams. Siloes and hierarchies collapse in emerging organizational forms, powered by seamless collaboration and the ability to pull resources on demand. This enables the introduction of flatter, leaner organizational structures and devolves greater decision making to the lower levels of the organisation. Recent Accenture research shows that 79 percent of executives agree that the workforce of the future will be structured more by projects than by job functions<sup>23</sup>. In the same study, 86 percent of them report leveraging the power of collaboration across their employees to achieve high performance<sup>24</sup>.

Collaboration is extending beyond organizational walls. Organizations can now quickly and easily source talent from anywhere within or outside company boundaries. In fact, according to Accenture’s research, more than 80 percent of surveyed executives already leverage an «extended workforce» approach to fill skills gaps<sup>25</sup>. This is the “liquid” workforce.

Wordpress parent company Automattic uses technology to run their company much differently than most, and more like the scenario above. Automattic’s staff of 450 spans 45 different countries and has eliminated traditional organizational hierarchies: business is done based on project teams ranging from two to 12 workers.

Teams are encouraged to experiment with new ways of collaborating to complete jobs, and so far, the experiment has been a great success. Automattic is valued at more than \$1 billion, and has become the ubiquitous leader in content management on the Internet with 25 percent of websites using the Automattic platform<sup>26</sup>.

New technology companies aren’t the only ones reinventing the traditional approach to the workforce; incumbent enterprises are doing it, too. Procter & Gamble (P&G) is experimenting with larger external talent marketplaces. The 180-year-old company is embracing on-demand talent as true innovation, augmenting their current workforce with freelance workers. P&G recently completed a pilot program using Upwork’s freelance management system Upwork Enterprise, and the results speak for themselves: products from the pilot program were delivered faster and at lower cost than with conventional methods 60 percent of the time<sup>27</sup>.

To successfully rotate to digital, business leaders shall equip their teams with the abilities and skills to support their organizations’ digital transformation and experiment with different ways of organizing work. They need to form new types of partnerships to make the most of non-traditional talent pools. And they must build a diverse, digitally savvy team that can inspire and apply flexible and agile ways of working.

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, maths
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Figure 1.22. Comparing skills demand, 2018 vs. 2022, top ten

In short, digital is far from dehumanizing. On the contrary, it is precisely what makes work radically more human: more tailored to individual strengths, more flexible and portable, more collaborative and more meaningful to employees throughout the organization.

19. The new jobs are based on Accenture’s research and internal analysis

20. Accenture Strategy Digital Operating Models research, 2016

21. Infosys, Amplifying human potential: Education and skills for the fourth industrial revolution, 2016, [http://boletines.privadigital.com/%7B6139fde3-3fa4-42aa-83db-ca38e78b51e6%7D\\_Infosys-Amplifying-Human-Potential.pdf](http://boletines.privadigital.com/%7B6139fde3-3fa4-42aa-83db-ca38e78b51e6%7D_Infosys-Amplifying-Human-Potential.pdf)

22. Future of Jobs Survey 2018, World Economic Forum, [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs\\_2018.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf)

23. Accenture Technology Vision, 2016

24. Accenture Volatility and Agility Study, 2014

25. Accenture Volatility and Agility Study, 2014

26. “This CEO Runs a Billion-Dollar Company with No Offices or Email,” Inc., March 16, 2016. <http://www.inc.com/glenn-leibowitz/meet-the-ceo-running-a-billion-dollar-company-with-no-offices-or-email.html>; “Automattic - An IPO Candidate in 2016?” Investopedia, January 27, 2016. <http://www.investopedia.com/articles/markets/012716/automattic-ipo-candidate-2016.asp>

27. “The Talent Potential: Leveraging the Freelance Marketplace to Harness a Global Talent Pool,” Panel Discussion at the 2016 CWS Summit North America, September 19, 2016. <http://www.cvent.com/events/2016-workforce-solutions-connect/custom-39-c06c1a44bbe34d-daa35cbfddbf0c199d.aspx>

# 1.7 DIGITAL TRANSFORMS GOVERNMENTS

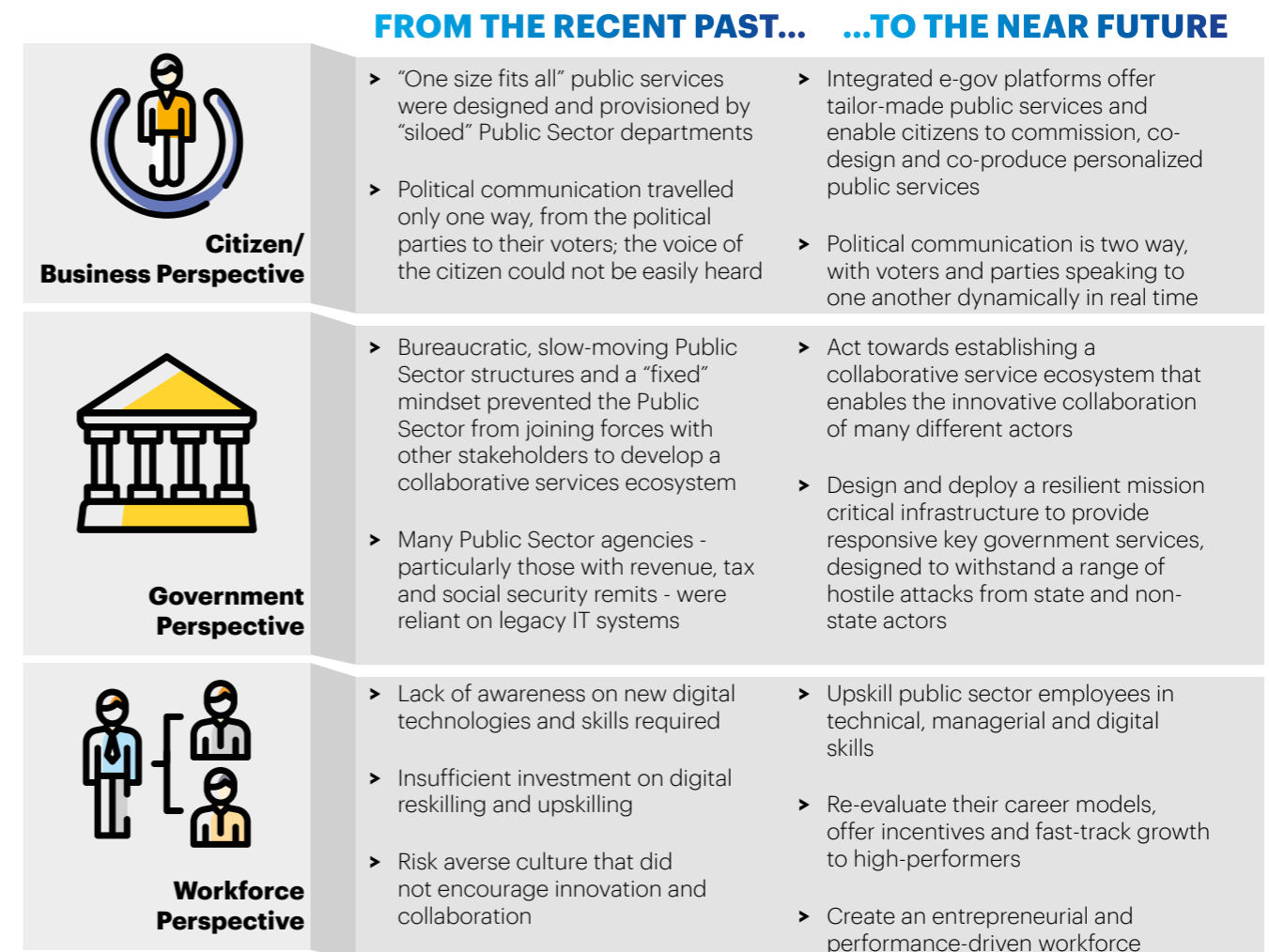
## TODAY'S DIGITAL CUSTOMER IS YOUR DIGITAL CITIZEN

The "liquid expectations" set by the digital services that we all enjoy as customers also transform the way we engage with Government as citizens. We, as citizens, expect Governments to follow suit and provide comparable digital experiences. In fact, according to research, 85 percent of citizens have the same or higher expectations from government digital services as they do from the private sector. A whopping 76 percent of them state that they would be more willing to engage with the Government provided that digital services were improved<sup>28</sup>.

But what do businesses and citizens require from their Governments? Evidence suggests that both require faster, simpler and cheaper access to the provided services. Increased security and privacy, and a deeper engagement in digital service co-creation<sup>29</sup>.

- > **Data Security & Privacy:** At the top of citizens priorities is personal data privacy and security. 78 percent of citizens state that they want their Government to do more in order to guarantee the security and privacy of their personal data. In addition, about 66 percent of citizens surveyed wanted the agencies which share their data to better specify how and what can be shared.
- > **Digital Innovation & Technology:** Citizens and businesses require from their Governments to use innovative technologies and solutions. 62 percent of citizens acknowledge the need for Governments to use digital and cost optimize.
- > **Personalization:** Citizens state that they are far from being satisfied with the customer experiences provided by Public Administration agencies. In fact, only 40 percent of citizens surveyed, consider the public services offered to be personalized, easy to use, and simple to understand.
- > **Trust:** The quality of digital services provided by the Public Administration agencies is not just a question of convenience for citizens: it is ultimately about trust. Testament for this stands the fact that 59 percent for citizens surveyed say that the provision of an easier, online access to Government's budgeting and spending, would significantly increase their trust.

Digital businesses and citizens are empowered in a way that previous generations never were. They can initiate and dictate the dynamics of the citizen-to-government relationship in a whole new paradigm. Digitally advanced Governments around the world have already embarked on extensive digital transformation journeys. These journeys metamorphose and convert them from their "analogue" state to their digital equivalents (see Figure 1.23).



**Policy Changes are required to move from Past to Future** →

Figure 1.23. Governments - From Analogue to Digital

28. Accenture 2015 Citizen Pulse Survey  
29. Accenture Public Service Global Citizen Survey 2017

A powerful tool towards Governments' moving into the future are the digital technologies that they select to adopt. Adoption patterns may differ by geography, but the appetite for embracing digital is clearly demonstrated<sup>30</sup> (see Figure 1.24).

## THE CHARACTERISTICS OF THE FUTURE-READY, DIGITAL GOVERNMENTS

Future-ready Governments share a set of common characteristics. They are digital by default and provide personalized, omni-channel services that operate 24/7. These services are supported by a revamped IT infrastructure, underpinned by open standards and interfaces that enable data exchange and insight generation.

- > **Digital by Default:** In any interaction between the government and the users of a given service, the user is obliged to use the digital channel unless there are good countervailing reasons

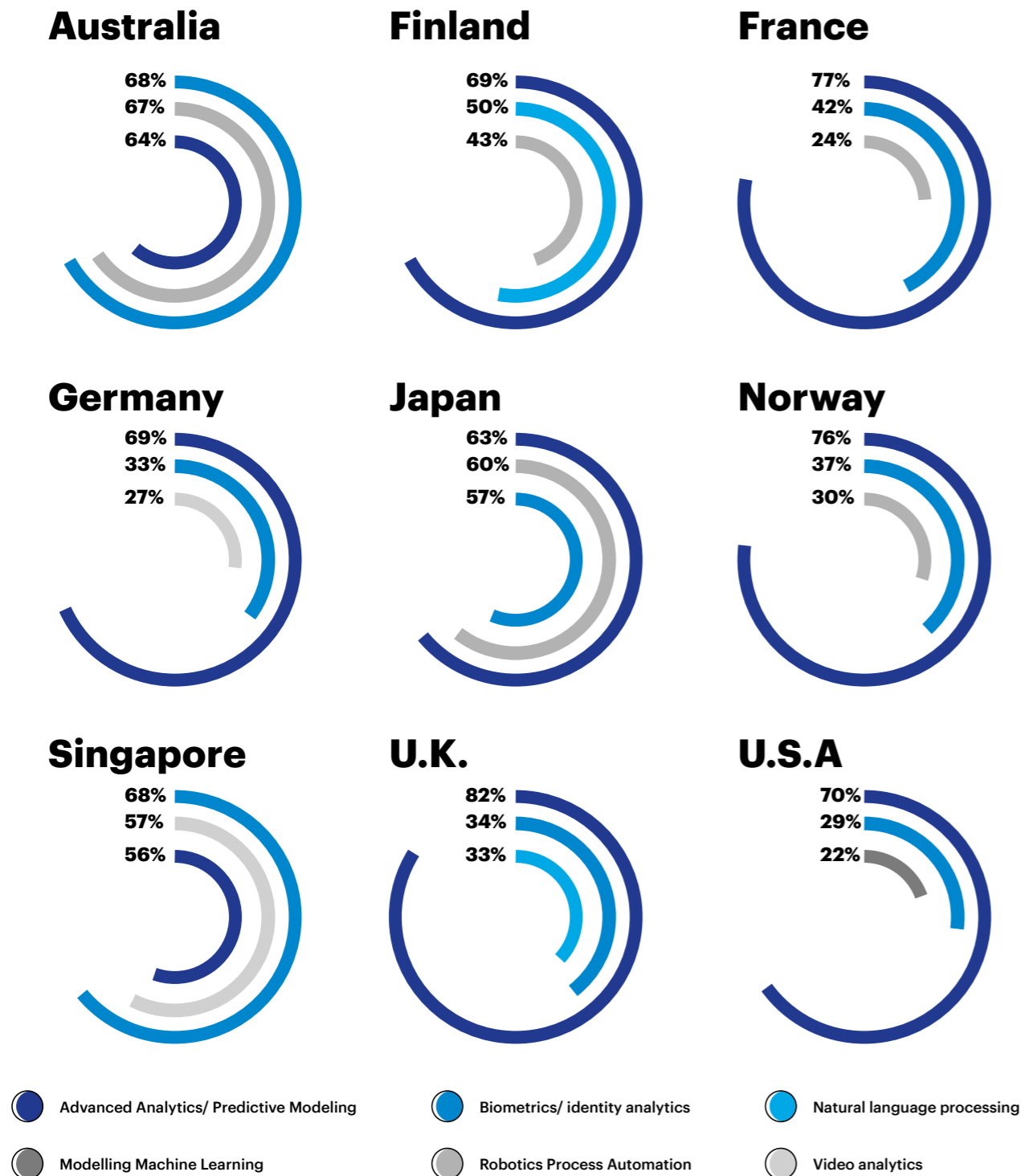


Figure 1.24. Implementation of Digital Technologies by Country (% of Public Administration Agencies)

30. Accenture Public Service Intelligent Technologies Research 2017

### The United Kingdom - Moving toward "Digital by Default"

The UK government clearly embraced some years ago a strong digital strategy with the objective of creating world-class, citizen-centric services while driving efficiency gains and economic progress. The government established the Government Digital Service (GDS), a new team within its Cabinet Office, responsible for scaling up the digital services provided to citizens. Defined by a robust implementation road map and key performance indicators, the digital strategy contained 16 actions the Government should take to become "Digital by Default."

Rebecca Kemp, policy team leader at GDS, explained "Digital by Default" as "everyone who chooses to do it digitally can do it that way and everyone who can't do it digitally is not excluded".

Source: <https://gds.blog.gov.uk/>, <https://www.gov.uk/government/publications/government-digital-strategy/governmentdigital-strategy>, <https://gds.blog.gov.uk/author/rebeccakempgds/>

- > **24/7:** Technology allows the delivery of public services in real time. Digital public services do not stop working after 6pm and do not shut down on weekends
- > **User Friendliness & Inclusiveness:** Public services should be available for everyone, not only for the digitally savvy citizens. Digital public services should use an easy-to-navigate and intuitive user interface

- > **Single Point of Entry:** For user convenience, public services should be accessible from a single portal through single identification. Users don't need to find their way through a maze of government websites

#### **Norway - Altinn, the Norwegian online portal**

Altinn, created in 2002 and updated as part of the Altinn 2 program in 2010, is a 24/7 online portal that has significantly eased the burden of public reporting for businesses, citizens and administrators. The portal started out as a bottom-up, experimental initiative with limited funds. Now nearly half a million businesses do their statutory reporting through the portal and over 700 different public forms are available. Just three years after the introduction of online tax forms, 85 percent of businesses used Altinn to complete their tax reports, reflecting a strong user-focused design and trust and assurance features built into the system. Businesses can deal with all financial reporting through one single entry point rather than dealing with numerous agencies. The portal also gives businesses a better overview of their financial and regulatory information.

Source: <https://www.altinn.no/en/about-altinn/>, Accenture Analysis

- > **Once-only:** This means eliminating the unnecessary administrative burden that occurs when users are required to supply the same information more than once to public administrations. Under this scenario, the databases of all public authorities are interconnected, and information stored by one entity is available to the other

#### **The United Kingdom - "Tell Us Once"**

"Tell Us Once," is a cross-government program that allows citizens to report a birth or death to the central government and local authorities-such as the Department for Work and Pensions and the Driver and Vehicle Licensing Agency-through a single point of Contact. The program has seen high levels of adoption-96 percent of local authorities have opted for it and there has been strong collaboration between central and local government bodies.

The program has significantly reduced the complexity of citizens' interaction with the Government and has been estimated to lead to major cost savings over the next 10 years: US\$302 million for central and local Governments, and US\$104 million for the citizens.

Source: <https://www.gov.uk/after-a-death/organisations-you-need-to-contact-and-tell-us-once>

- > **Omni-channel services:** The user is provided with a seamless digital public services experience no matter the device - a desktop or a mobile device - is being used to access it

- > **No Legacy:** This principle requires public administrations to renew all state information technology systems

#### **India - Release of public service applications on smartphones**

The Indian Department of Electronics and Information Technology (DeitY) has been aggressively promoting an app culture in the country under the leadership of Prime Minister Narendra Modi. As per the department, 666 applications were made active on different app stores, along with 62 others in the demonstration stage the last year. These were developed by the 10 Centre for Development of Advanced Computing (C-DAC) units all over the country. Officials from DeitY informed that the Prime Minister's Office (PMO) has ordered them to get apps made for specific purposes and promote these as part of the Digital India initiative. It is because the smartphone penetration in the rural and urban areas has drastically increased.

According to DeitY, the government apps are finding a lot of takers in the rural areas and apps on various aspects of eGovernance, agriculture, basic healthcare, sanitation and education are being downloaded a lot of times. For promoting these apps in rural areas, the government is reaching out to gram panchayat heads and school teachers. They tell people about how these apps would benefit them and help them establish a direct connect with the government. The government also plans to promote these apps at its common service centers (CSCs) in rural areas.

Source: <http://egov.eletsonline.com/2015/12/govt-pushes-apps-for-direct-rural-connect/>





- **Open Standards:** Service-oriented architecture of public services is underpinned by open standards and open-source technologies, enabling digital collaboration

### USA - New York City

The NYC DataBridge is a city-wide data sharing platform that assimilates data feeds from over 50 source systems, from roughly 40 agencies and external organizations. This data is merged to fit geographical information and is also used for cross-agency analysis. Readily available data and new cross-agency comparisons will help to encourage a deeper performance management culture, not only pushing agencies towards improvement, but also celebrating agencies that are performing exceptionally well.

Over the past four years, by harnessing Big Data, the DataBridge has directly resulted in: the location of structures at risk of catching fire; the accelerated removal of Hurricane Sandy debris; the identification of restaurants illegally dumping in sewers; and the prevention of illegal cigarette sales.

NYC has also created the 'Analytics 101' course for City government employees to provide them with an overview of available data and tools. As employees are gaining new digital skills, leaders can set performance management targets to fit alongside this training and the use of the DataBridge tools. The city also shares its data with academic institutions, including Columbia University. This is another method of building trust and accountability as Columbia can freely conduct analysis of the data generated by government sources and the extent to which agencies are managing their responsibilities.

Source: *City of New York: Using Data Analytics to Achieve Greater Efficiency and Cost Savings*, Accenture, 2013, [https://www.accenture.com/t20150624T211456\\_w\\_us-en/\\_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Technology\\_7/Accenture-Data-Analytics-Helps-New-York-City-Boost-Efficiency-Spend-Wisely.pdf](https://www.accenture.com/t20150624T211456_w_us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Technology_7/Accenture-Data-Analytics-Helps-New-York-City-Boost-Efficiency-Spend-Wisely.pdf)

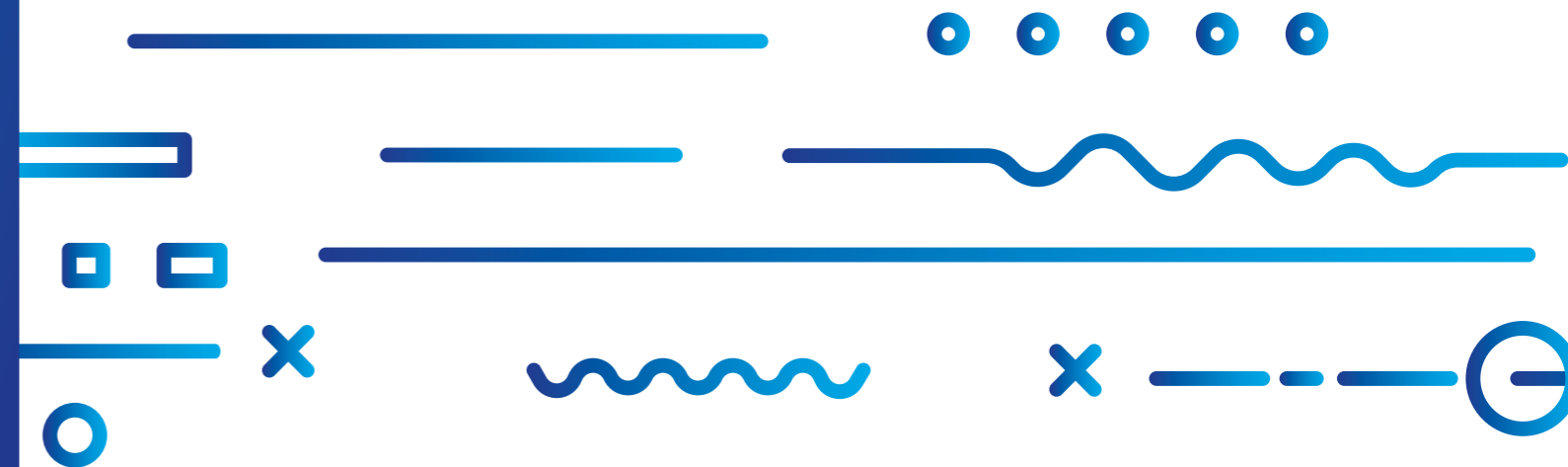
These common traits and characteristics are what we refer to as "Digitalization within Government". As Governments are recognized to be major economic actors that often account for big chunks of economic activity, they also carry the responsibility to act as "digital catalysts" and enable the "Digitalization through Government".

In parallel to their internal digital transformation, Governments shall also focus on their role as "market makers". In this context, Governments shall create the right regulatory environment, promote innovative investment and help digital actors connect to emerging eco-systems.

Digital Governments must re-define themselves to be a partner, an enabler or a facilitator, rather than just the provider. In fact, future-ready, digital Governments actively seek these partnerships and explore a range of models with different risk and reward structures.

Building a system on open-source technologies, service-oriented architectures, specified common standards for information exchange and up-to-date systems, Governments can work with private vendors to create a range of innovative solutions to address collective problems at a city, state, national, and even international level. This concept is referred to as "Government as a Platform" concept, an idea originally put forward by Tim O'Reilly back in 2010.

Digital Governments are best positioned to become leaders of technological change and directly affect their nations' growth and competitiveness.





# 2. CYPRUS'S DIGITAL ANATOMY



# 2.1 INTRODUCTION

Countries around the world are transforming to increase their productivity and economic performance and to ensure social progress. Digital is at the heart of this transformation and can offer unprecedented opportunities<sup>1</sup>.

A number of indexes at a worldwide basis have already been established in an effort to measure and quantify the worldwide digital transformation at a national level. The Networked Readiness Index (NRI)<sup>2</sup>, published by the World Economic Forum, (WEF), is one of the most widely used. This index assesses countries' preparedness to reap the benefits of enabling technologies and capitalize on the opportunities presented by the digital revolution and beyond.

According to the latest index values, during the last years the networked readiness is improving almost everywhere around the world, with a clear upward trend in mean country performance across all regions. In fact, as per index results the group of the top 10 performers consists of a mix of high-income Southeast Asian (Singapore and Japan) and European countries (Finland, Sweden, Norway, the Netherlands, Switzerland, the United Kingdom, and Luxembourg), as well as the United States (see Figure 2.1).

## The top 10 countries harnessing Information Technology

Network Readiness Index 2016	Global Rank
Singapore	1
Finland	2
Sweden	3
Norway	4
United States	5
Netherlands	6
Switzerland	7
United Kingdom	8
Luxemburg	9
Japan	10

Figure 2.1. The top 10 countries harnessing information technology, NRI 2016

1. Rolf Alter, Christian Bason, Olivier Costa, Arnis Daugulis, Brian Hayes, Michael Kaeding, Robert Madelin, Bernard Le Masson, Francis Maude, Kyriakos Mitsotakis, Arnaud Mourot, Robert-Jan Smits and Brigitte Zypries, *Delivering Public Service for the Future: How Europe Can Lead Public-Sector Transformation* (Brussels: The Lisbon Council, the College of Europe and Accenture, 2014). <http://www.lisboncouncil.net/publication/publication/117-delivering-public-service-for-the-future.html>  
 2. <http://reports.weforum.org/global-information-technology-report-2016>



**Singapore** is leading the digital pack and has ranked first in the world in terms of its political and regulatory environment, its digital skills and the use of digital by its government. Overall, its outstanding performance can be attributed, to a large extent, to the country's strong government commitment to the digital agenda, including its Smart Nation program.

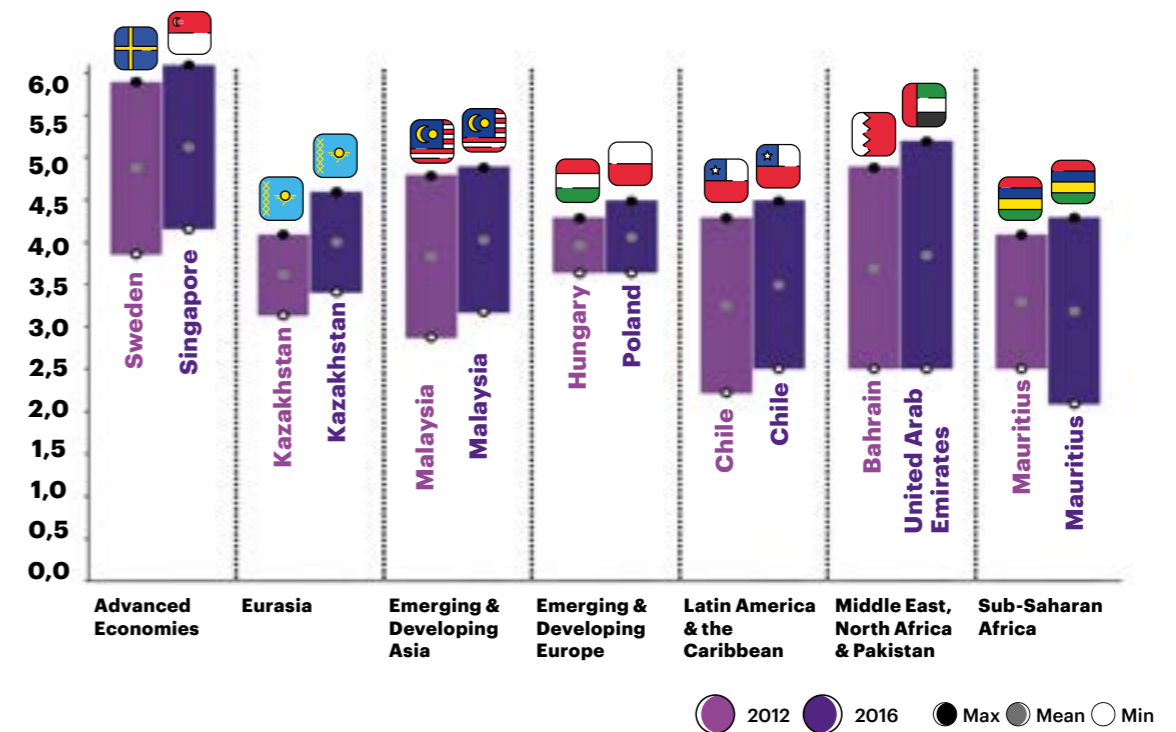


The **United States** ranks 5<sup>th</sup> among the top 10 NRI performers. US stands out mainly in terms of its extremely favorable business and innovation environment, which has given rise to one of the most digitalized business sectors globally. Additionally, the public sector effectively leverages digital technologies to deliver services to citizens and to facilitate participation.



**Japan** scores 10<sup>th</sup> among the global frontrunners, with its business and innovation environment being its strongest point, mainly across the perceived availability of venture capital, the quality of management schools and government procurement of advanced technologies.

Although at an aggregate level the NRI indicates an upward move on the global digital performance, a more granular view of the index indicates that there is a clear divergence on regional performances among different groups of countries across the world (see Figure 2.2).



Source: NRI, 2012-2016 editions

Note: Numbers are based on a constant sample of 132 economies. Groupings follow the IMF classification; IMF "CIS" = "Eurasia"

Figure 2.2. The Networked Readiness Index by regional group, 2012 vs 2016, Score (1 - 7)

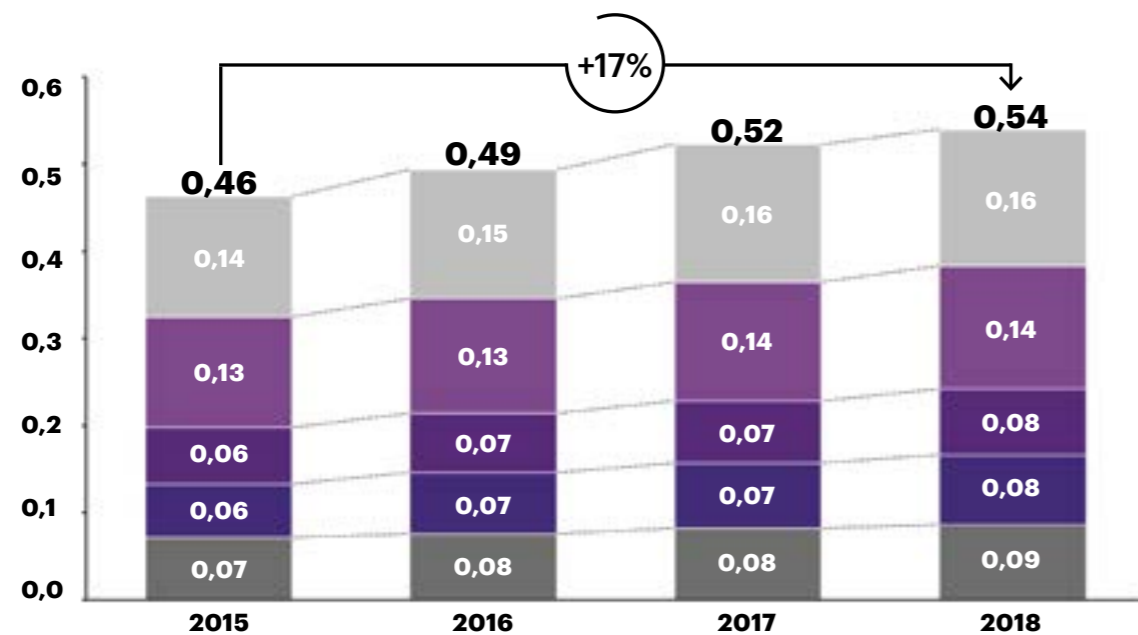
The message is clear: Digital becomes an integral item on the growth and development agenda of countries worldwide. However, it is evident that some countries appear more ready than the others.

# 2.2 UNDERSTANDING THE DIGITAL STATE OF EUROPE

Similarly to WEF, the European Commission, has introduced a structured performance management framework that measures the progress of the European digital economy, the Digital Scorecard. To actively monitor and track this Scorecard, it has defined a composite index of digital readiness, the Digital Economy and Society Index (DESI)<sup>3</sup>.

According to the DESI index for 2018, Europe gradually becomes more digital. During the last four years EU's digital performance has improved by 17 percentage points, while compared to last year's index, it has improved by 4 percentage points (see Figure 2.3).

This index summarizes relevant indicators of Europe's digital performance and tracks the performance of EU member states. The index depicts the digital performance of the 28-member states across several key dimensions.



Connectivity Human Capital Use of Internet Integration of Digital Technology Digital Public Services

Source: Digital Economy and Society Index 2018, European Commission

Figure 2.3. EU 28 DESI score, 2015-2018 (# out of 1)

3. Digital Single Market - Digital Scoreboard: <https://ec.europa.eu/digital-single-market/en/digital-scoreboard>

Over the last years connectivity across Europe has improved, with broadband, mobile and 4G network penetration steadily on the rise<sup>4</sup>.

On the digital skills area, moderate improvements have been recorded. Still, an impressive 43 percent of European citizens do not possess basic skills, such as using email or connecting to various devices<sup>5</sup>. With regards to the integration of technology by businesses, we note a slight improvement in electronic information sharing (from 26 percent in 2013 to 34 percent of businesses in 2017) and e-invoicing (from 11 percent in 2014 to 18 percent in 2016)<sup>6</sup>.

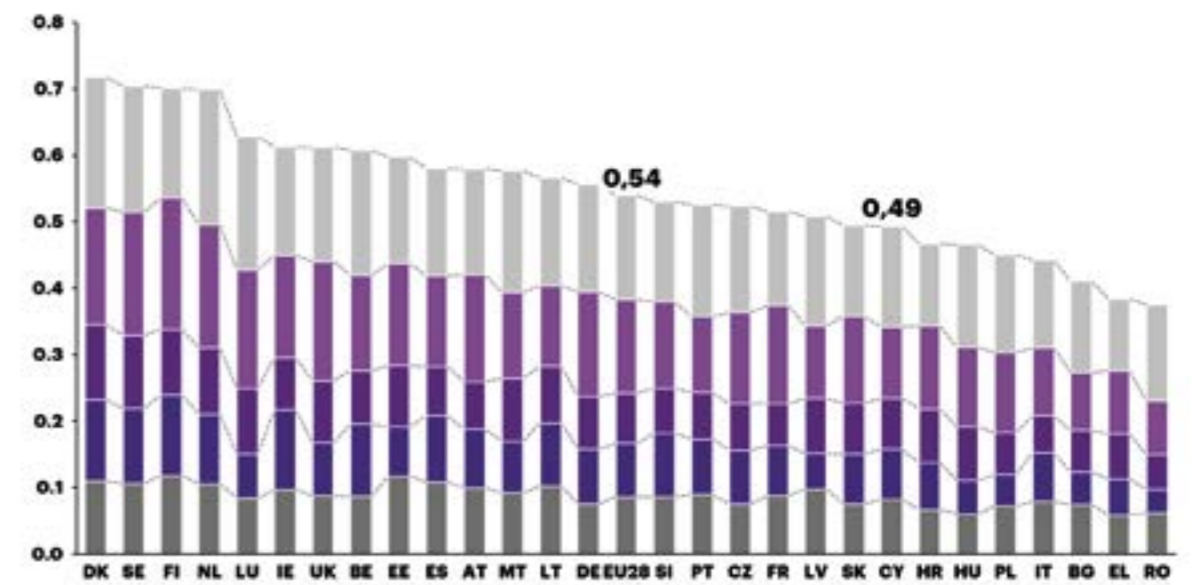
On the eCommerce space, SMEs show increased adoption of digital practices but still mostly sell to domestic customers and not cross-border<sup>7</sup>.

Finally, the quality of European online public services improved with an increase of 5

percentage points in pre-filled forms (measuring the reuse of user data already known to the public administration)<sup>8</sup>.

Similarly to the NRI findings, divergent country performances are also observed. In fact, the digital rift between top performers and countries scoring near the bottom remains notably wide. In 2014, the digital gap between the most and least digital countries was 36 percentage points while in 2017 this gap increased by 2 percentage points, to 38 percentage points in total. In 2017, Denmark, Sweden, Finland, and the Netherlands lead the DESI followed by Luxembourg, Ireland, the UK, Belgium, Estonia, and Spain (see Figure 2.4).

At the other side of the spectrum, several EU states including Poland, Italy, Bulgaria, Greece and Romania, are still behind with regards to their digital performance compared to the EU average<sup>9</sup>.



Connectivity Human Capital Use of Internet Integration of Digital Technology Digital Public Services

Source: Digital Economy and Society Index 2018, European Commission

Figure 2.4. Digital Economy and Society Index (DESI) 2018 ranking

According to DESI, Cyprus is ranked 21<sup>st</sup> out of 28 countries in the Digital Economy and Society Index (DESI) and scores at the lower end of digital maturity curve, between Slovakia and Hungary.

4. <https://ec.europa.eu/digital-single-market/en/connectivity>

5. <https://ec.europa.eu/digital-single-market/en/human-capital>

6. <https://ec.europa.eu/digital-single-market/en/integration-digital-technology>

7. <https://ec.europa.eu/digital-single-market/en/integration-digital-technology>

8. <https://ec.europa.eu/digital-single-market/en/digital-public-services-scoreboard>

9. "How digital is your country? Europe improves but still needs to close digital Gap", European Commission, 2017

# 2.3 EVALUATING CYPRUS'S DIGITAL ANATOMY

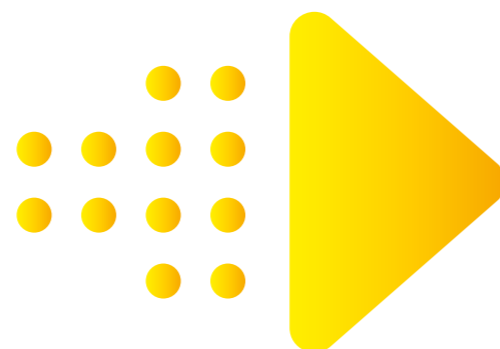
## MEASURING THE DIGITAL MATURITY

As seen in the previous section, the digital maturity of a country is measured mainly through the contribution of the country's ICT sector to the national GDP. However, as the digital transformation spreads across the whole economy, we find that this approach is becoming increasingly one-sided.

To evaluate Cyprus's digital maturity and identify the underlying factors that can drive economic growth in the digital economy, Accenture, supported by Oxford Economics, applied the Digital Economic Opportunity Index (DEOI).

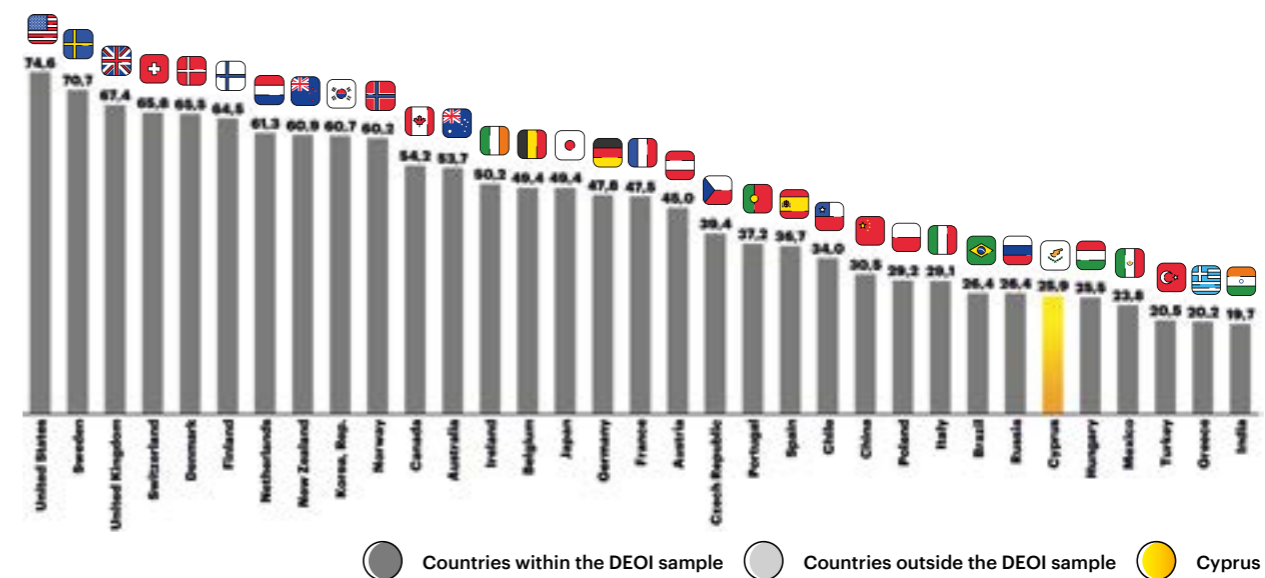
This index enables us to capture the extent to which digital has penetrated Cyprus's economic activity both at a national and at an industry level<sup>10</sup>.

The implementation of the DEOI methodology will expose the digital maturity of the country and that of select key industries. It will also provide valuable insight into how the country and its industries have prioritized their digital investments across different dimensions.



## CYPRUS'S DIGITAL MATURITY

According to Accenture's Digital Economic Opportunity Index (DEOI), Cyprus scores at the lower end of the digital maturity curve. In fact, the overall score of 25,9 out of 100 confirms Cyprus's relatively weak position against its global peers (see Figure 2.5).



Source: Oxford Economics, Accenture analysis

Figure 2.5. The digital economic opportunity index (DEOI) 2018, Global sample (# out of 100)

Cyprus's suboptimal position appears to be aligned with the findings of similar other indexes (see Figure 2.6).

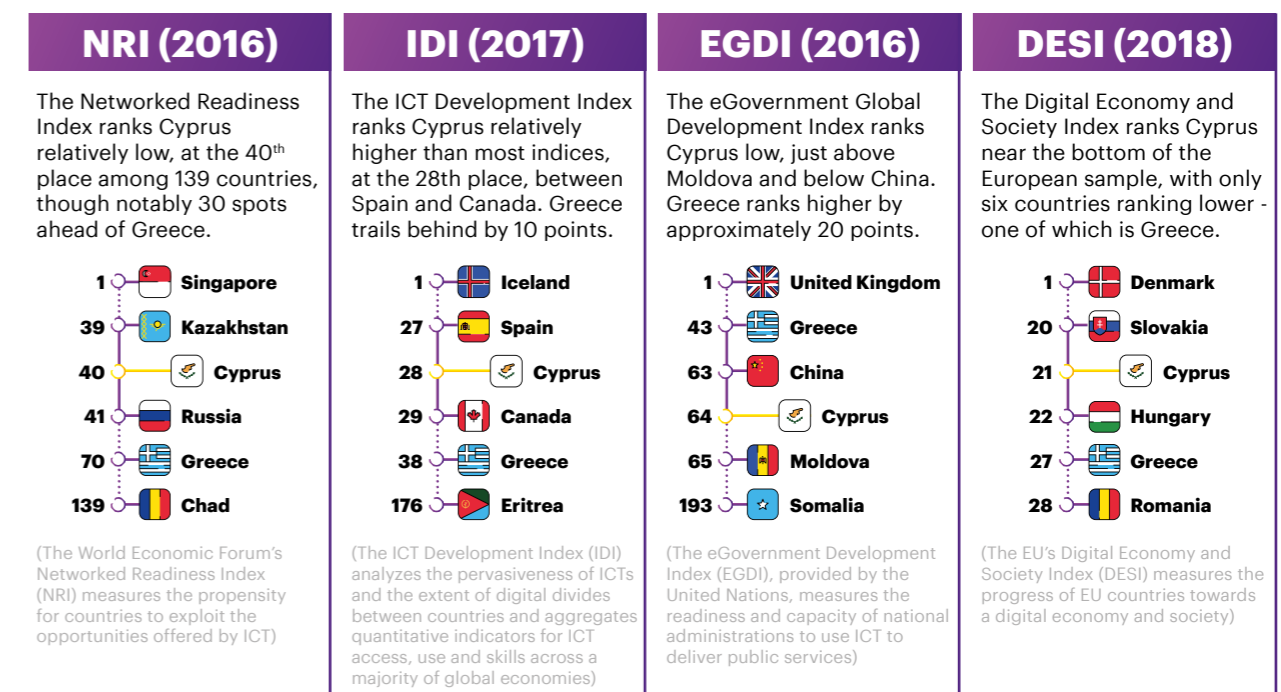
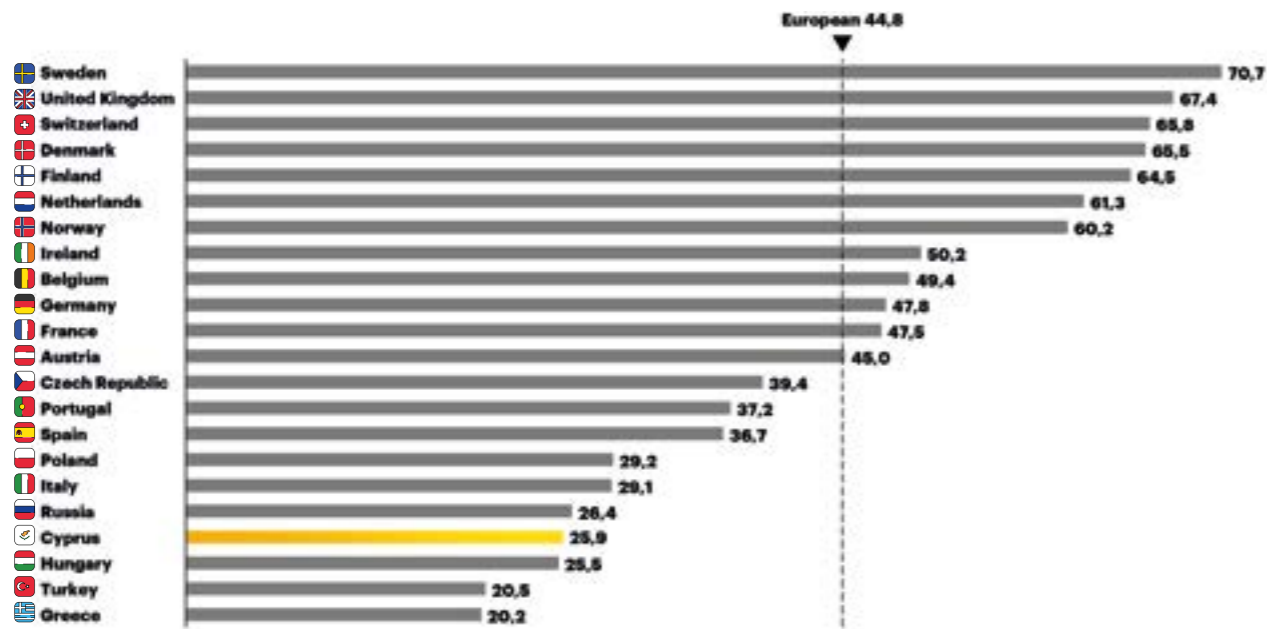


Figure 2.6. Cyprus's current digital state according to third party indexes

10. The DEOI will be applied both at a national level and across select key industries, varying the input data used in each case. The underlying input data comes from a variety of third party sources, including Eurostat, OECD, EU KLEMS, IDC, WEF, the Open Data Barometer, the UN, the World Bank and Accenture and Oxford Economics' proprietary datasets.

If we shift our focus to the European sample, Cyprus, with a total score of 25,9 points, is ranked on the 19<sup>th</sup> place out of 22 countries included in our sample (see Figure 2.7).



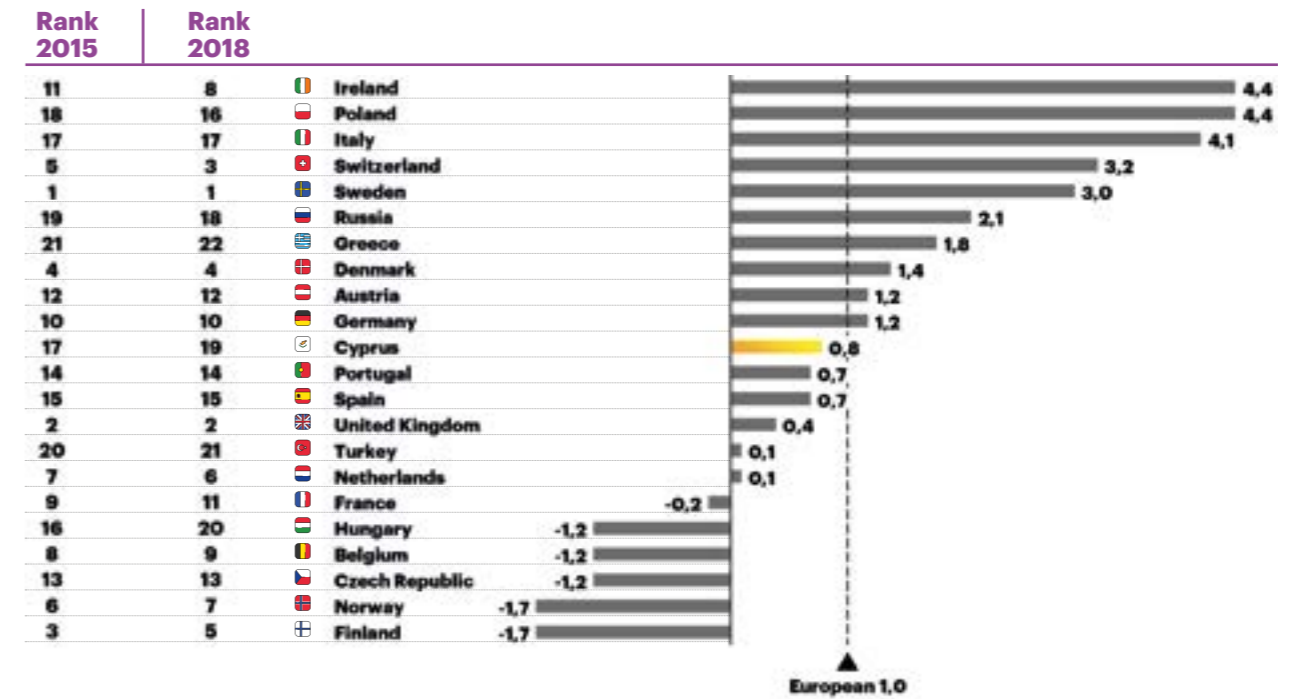
Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.7. The digital economic opportunity index (DEOI) 2018, European sample, 2018 (# out of 100)

This position is approximately 20 points below the European average and well behind the most digitalized European economies, such as Sweden (with DEOI score: 70,7), the United Kingdom (with DEOI score: 67,4), and Switzerland (with DEOI score: 65,8).

Cyprus scores close to the lower end of the European digital maturity curve, with Hungary (with DEOI score: 25,5), Turkey (with DEOI score: 20,5) and Greece (with DEOI score: 20,2) being the only countries demonstrating a lower digital maturity.

If we examine the evolution of the European sample's digital maturity from 2015 to 2018, we observe that Cyprus's digital maturity has increased over the last four years by 0,8 points. Despite this increase, in 2018 Cyprus is positioned on the 19<sup>th</sup> place (see Figure 2.8).



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.8. The Digital Economic Opportunity Index Evolution, European sample, 2015 - 2018 (# out of 100)

As this is a relative index, the manifested limited increase in Cyprus's digital maturity is due to a comparatively higher rate of digitalization registered in other sampled countries.

Ireland, Poland and Italy appear to have accelerated their rotation towards digital and to significantly improve their standing relatively to their European counterparts.



# 2.4 DISSECTING THE CYPRIOT DIGITAL MATURITY

## THE KEY LEVERS OF DIGITAL MATURITY

To further investigate the underlying factors that contribute to Cyprus's digital maturity, our DEOI methodology provides additional layers of analysis. The DEOI index consists of three equally weighted levers - digital skills, digital technologies and digital accelerators (see Figure 2.9).

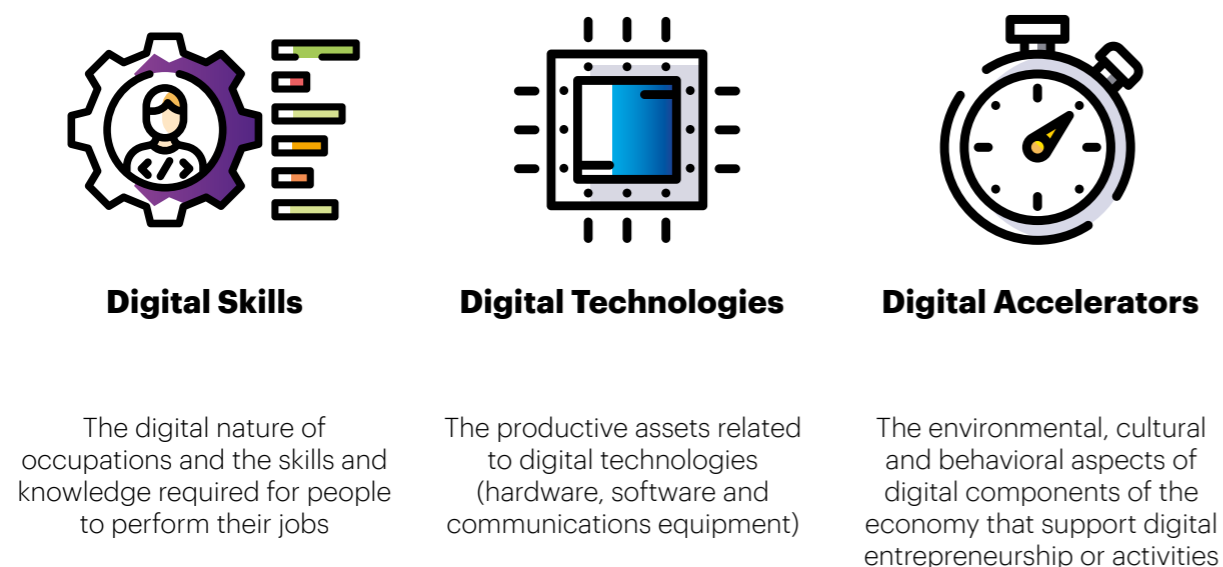


Figure 2.9. The DEOI Framework - The three levers

## Definition of the Key Levers



**Digital Skills**  
Digital skills measure the digital nature of occupations and the abilities and knowledge required to perform specific jobs. The key dimensions valued in this lever are:

- > **Stock of digital Skills:** degree to which the ICT workers are present in the economy
- > **Digital skills development:** effort performed by companies to train their employees in digital skills
- > **Digital ways of working:** presence of digital assets and tools such as mobility, social media, etc. in the day to day tasks



**Digital Technologies**  
Digital technologies measure the productive assets available (hardware, software and communications equipment). The key dimensions valued in this lever are:

- > **Digital capital stock:** degree of investment by companies in software and hardware assets
- > **Digital engagement:** use of digital assets in interactions with employees and customers
- > **Digital enablement:** adoption of innovative technologies such as Cloud, Analytics and IOT



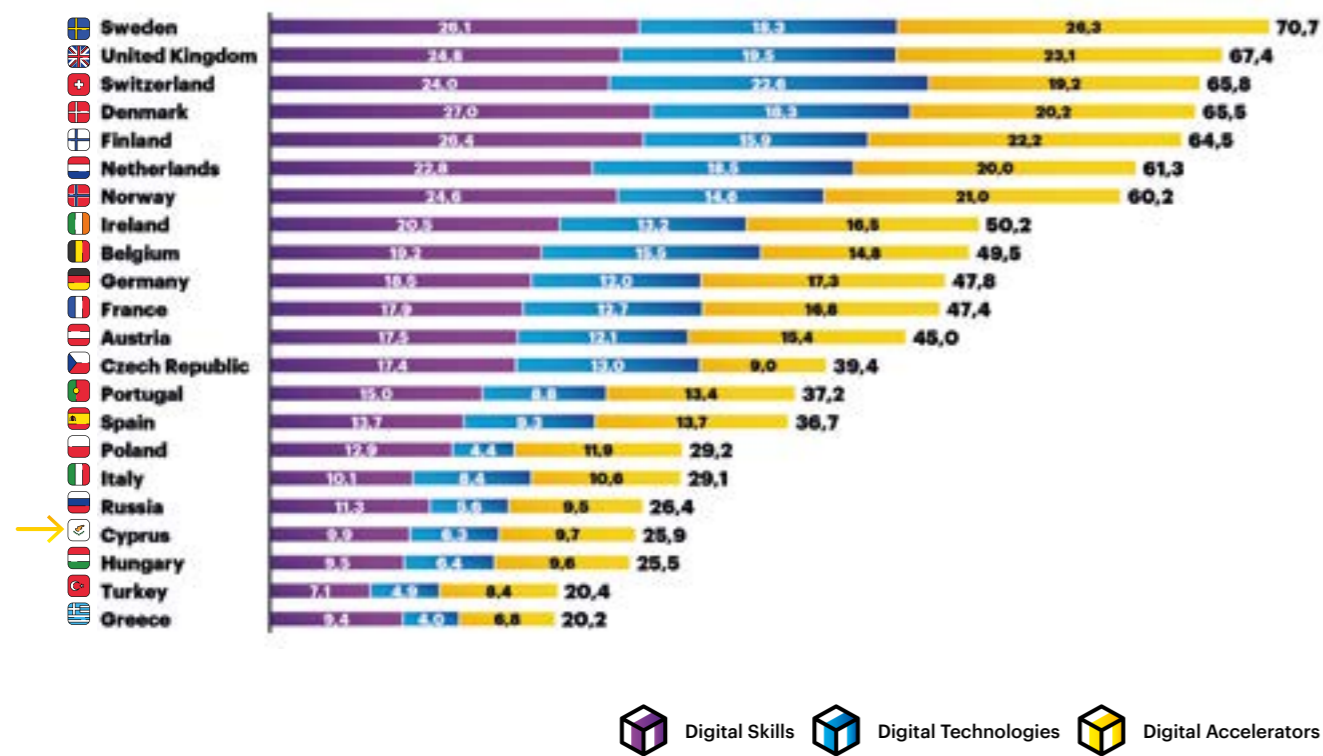
**Digital Accelerators**  
Digital accelerators measure the environmental, cultural and behavioral aspects of the digital components of the economy. The key dimensions valued in this lever are:

- > **National communications infrastructure:** availability and quality of internet connectivity and degree of access penetration of an economy
- > **Open Data & e-participation:** degree to which a Government's actions and investments incorporates digital as a key asset, in order to promote the use of Open Data and enhance e-Participation
- > **Digital business environment:** facilities provided by the environment to digital ways of working and digital business models



# ANALYSIS OF CYPRUS'S DIGITAL MATURITY

Our analysis of Cyprus's DEOI index indicates that Cyprus scores low across all three levers. In more detail, the Cypriot economy demonstrates a relatively higher maturity across its digital skills and accelerators levers but displays significant room for improvement across its digital technologies (see Figure 2.10).



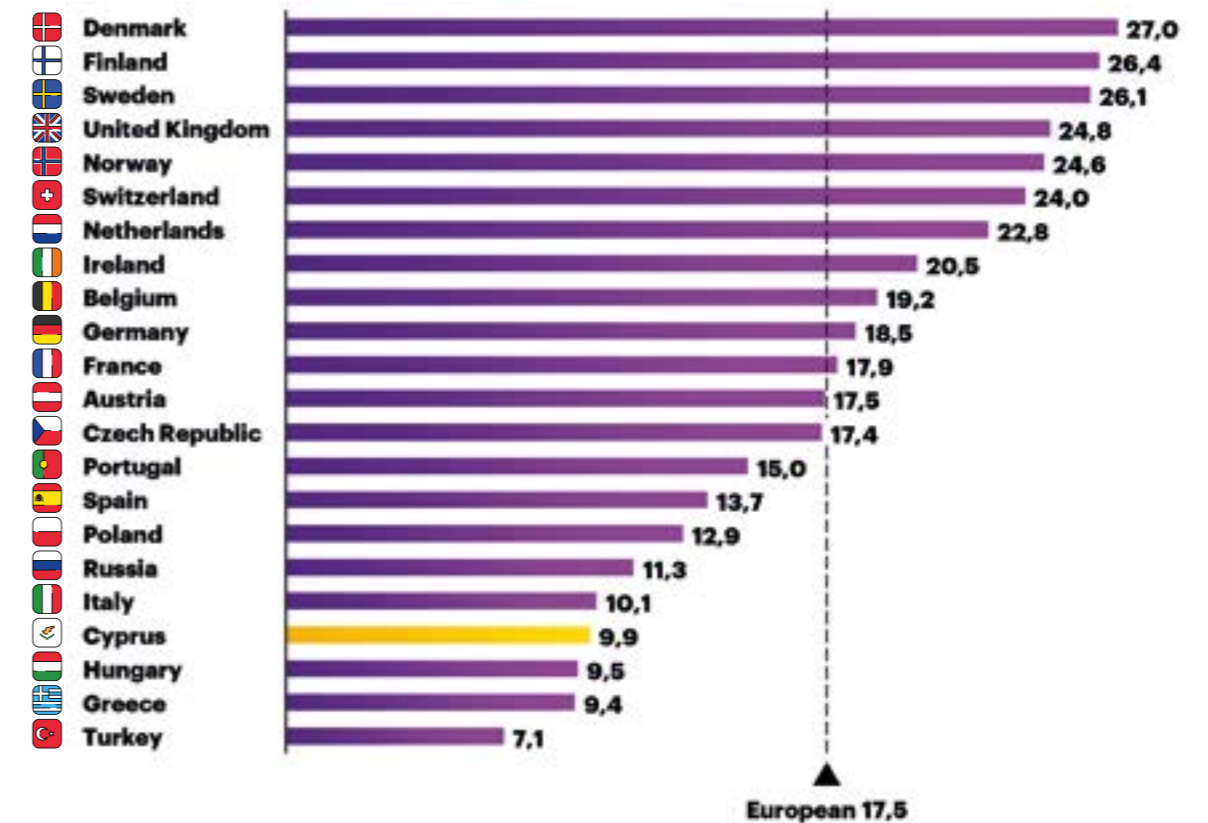
Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.10. The digital economic opportunity index (DEOI) 2018, European sample (# out of 100) - breakdown per lever

A deep dive into each lever, will surface the key development areas for Cyprus's digitalization.

# THE DIGITAL SKILLS LEVER ANALYSIS

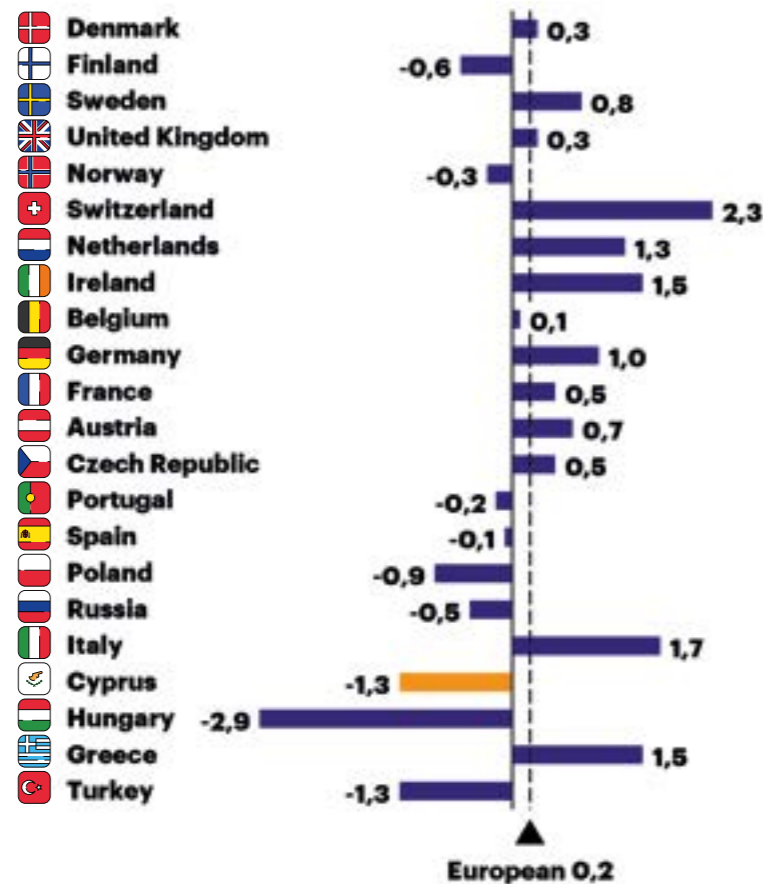
Zooming into the Digital Skills lever, in 2018 Cyprus scored 9,9 points out of 100. This score brought Cyprus at a low position against its peers, ranking 19<sup>th</sup> out of 22 and 7,6 points below the sample's average score (17,5 points). At the top of the board, we find Denmark that demonstrates the highest score across the digital skills lever (27 points) and is positioned 9,5 points above the sample's average (see Figure 2.11).



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.11. The digital economic opportunity index (DEOI) 2018, European sample (# out of 100) - The Digital Skills lever

When examining the Digital Skills lever's evolution over the last four years (2015 - 2018), we notice that Cyprus's score has decreased by 1,3 points. In fact, Cyprus demonstrated the second largest decrease with regards to its Digital Skills lever, second only to Hungary that demonstrated a 2,9-point decrease during the same years (see Figure 2.12).



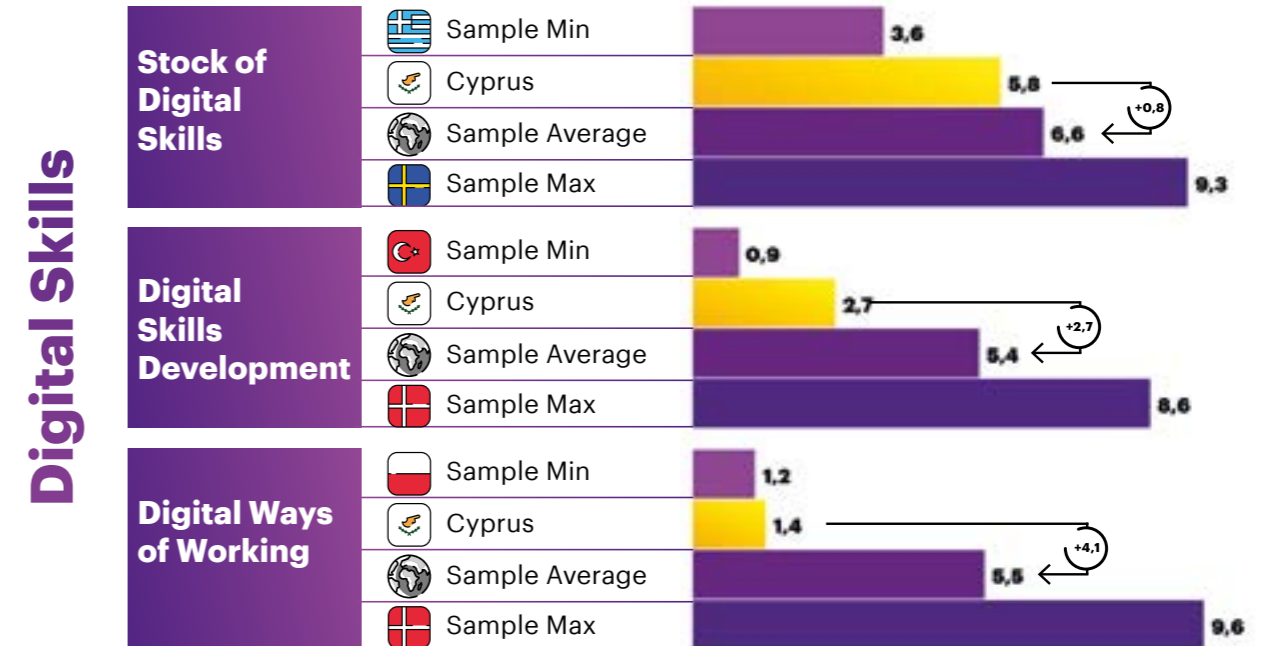
Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.12. The digital economic opportunity index (DEOI), European sample (# out of 100) - The Digital Skills lever score evolution, 2015 - 2018

As DEOI is a relative index, Cyprus's decrease across its Digital Skills lever indicates that over the last years other countries within our sample demonstrated a higher rate of digitalization across their digital skills and capabilities compared to efforts performed by Cyprus in this field.

According to our analysis, more than 50 percent of the sampled countries have scored above the sample's average score for the Digital Skills lever. This percentage indicates that Cyprus's peers have already acknowledged the high importance of digital skills. For this reason, appear to have already undertaken a set of initiatives to digitally reskill and upskill their workforce.

Zooming further into the digital skills lever, we observe that this is mainly influenced by the "Stock of Digital Skills", which contributes 5,8 out of the total 9,9 points and scores just 0,8 points behind the sample's average. On the contrary, Cyprus appears less mature in terms of the "Digital Skills Development" and "Digital Ways of Working" dimensions (see Figure 2.13).



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.13. The DEOI Digital skills dimension score 2018 (# out of 100)

With regards to Cyprus's "Stock of Digital Skills" our analysis indicates that Cyprus appears to score well mainly due to the relatively high number of Cypriot digital natives<sup>11</sup> (people aged below 30 years old) and a workforce that exhibits knowledge of basic digital skills<sup>12</sup>. However, at the same time Cyprus appears to lag behind its peers with regards to the percentage of ICT specialists active within its workforce (see Figure 2.14)<sup>13</sup>.

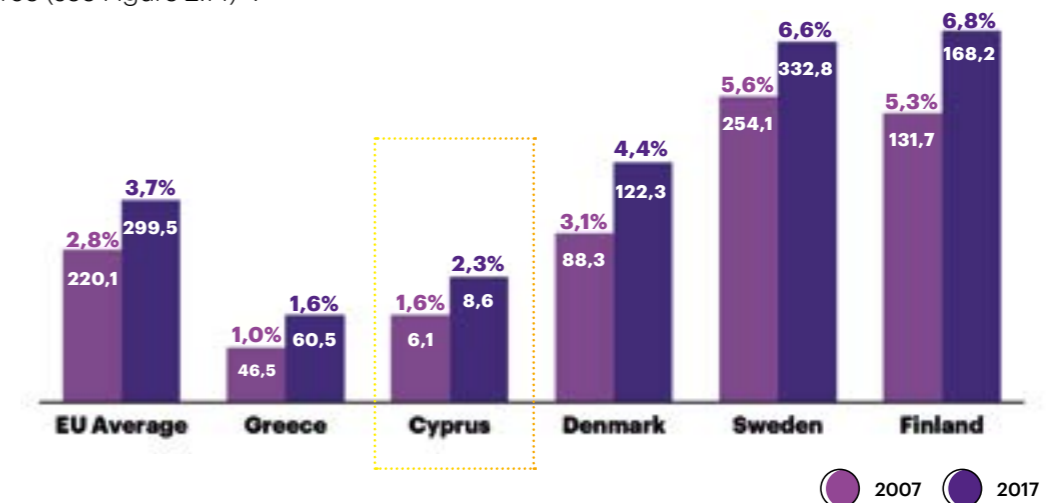


Figure 2.14. Employed ICT specialists 2007 & 2017 (# thousands, % of total employment)

11. Eurostat database, 2018  
 12. Digital Economy and Society Project  
 13. Europe's Digital Progress Report (EDPR) 2017 Country Profile Cyprus

Cyprus's low score across the "Digital Skills Development" dimension (with a 2,7-point score and almost 3 points below the European average), highlights the need for Cyprus to accelerate its efforts to develop the next generation of digital workforce and promote ICT skill adoption across all educational levels.

Data indicates that Cyprus's low performance across this aspect can be mainly attributed to the low percentage of Cypriot Computing and STEM<sup>14</sup> graduates, as well as to the limited investments performed by companies with regards to the digital upskilling and reskilling of their workforce. In fact, according to Eurostat<sup>15</sup> approximately 9 out of 1000 male and 7 out of 1000 female Cypriot citizens aged 20-29 years were STEM graduates in 2015 (see Figure 2.15), while 26 percent of Cypriot companies invested in 2017 for the provision of ICT training to their workforce<sup>16</sup> (see Figure 2.16).

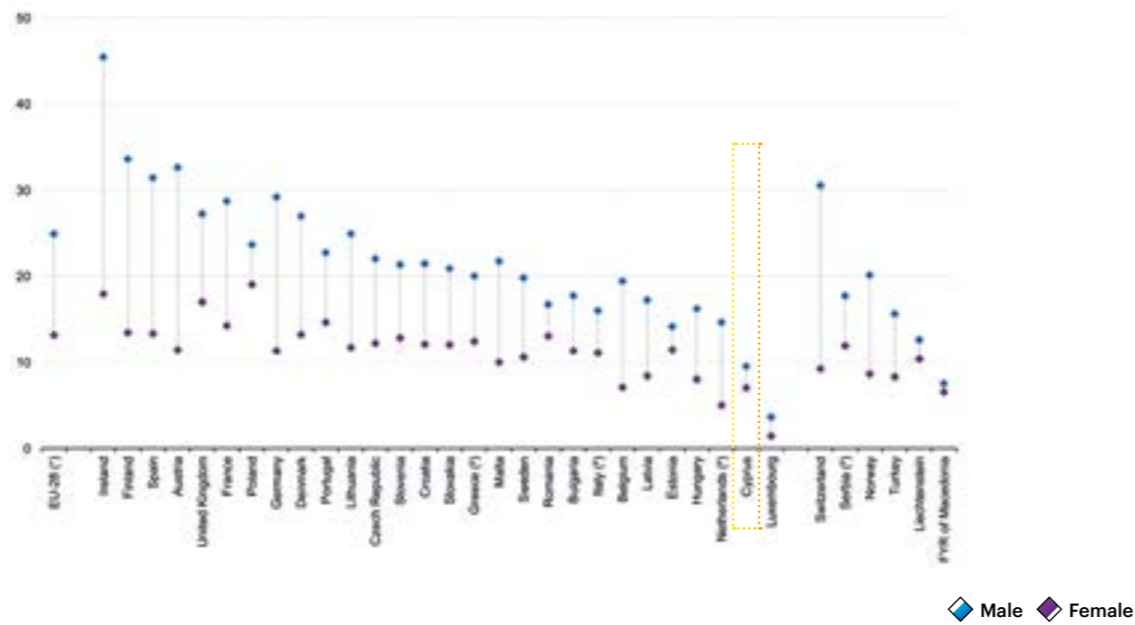


Figure 2.15. Number of students graduating from tertiary education in STEM sciences, 2015 (# per 1000 inhabitants aged 20-29 years)

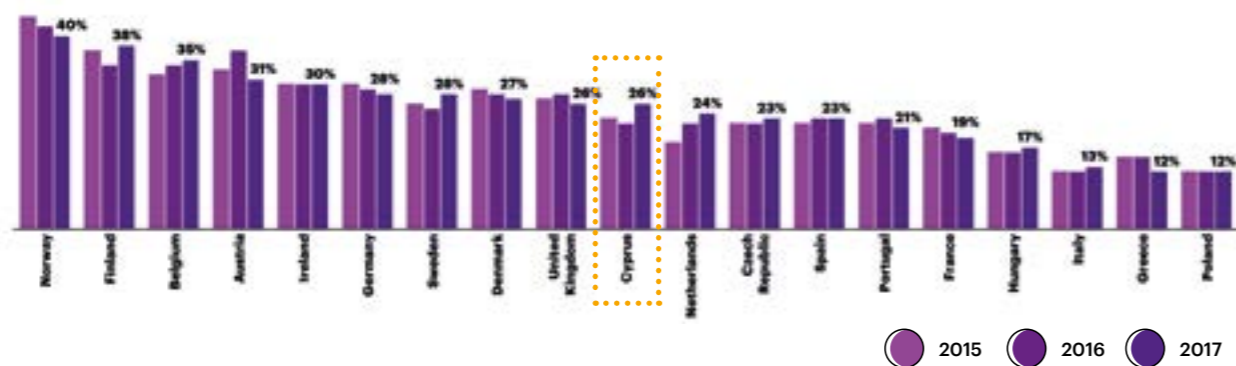


Figure 2.16. Companies which provide ICT training to their employees, (% of companies)

Finally, with regards to the "Digital Ways of Working" dimension, Cyprus demonstrates one of its lowest scores, as it achieves 1,4 points and is positioned second from the end. The 4,1-point gap from the sample's average indicates that Cyprus has significant room to cover in order to improve the workforce's internal collaboration and mobility.

14. STEM stands for Science, Technology, Engineering and Mathematics

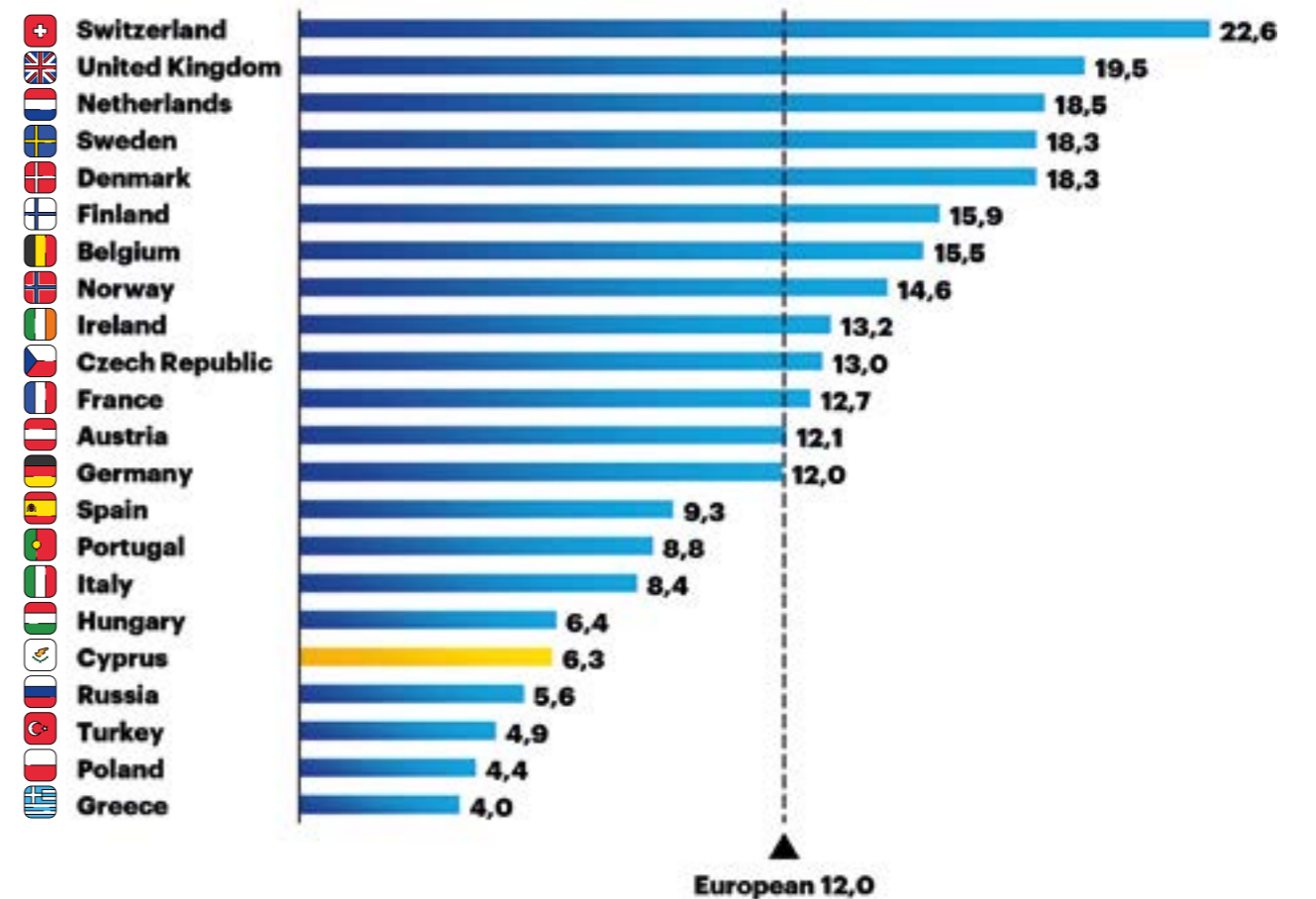
15. Eurostat, Tertiary education statistics,

[http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary\\_education\\_statistics#Further\\_Eurostat](http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics#Further_Eurostat)

16. Eurostat - Digital Economy and Society Database

## THE DIGITAL TECHNOLOGIES LEVER ANALYSIS

Moving to the second digital maturity lever, Cyprus appears to have made limited progress into integrating digital technologies. This leads to an overall low maturity across the Digital Technologies lever (DEOI score: 6,3 out of 100). At the other end of the spectrum, Switzerland and the United Kingdom appear to be frontrunners with regards to their adoption and implementation of new digital technologies, scoring 22,6 and 19,5 points respectively (see Figure 2.17).

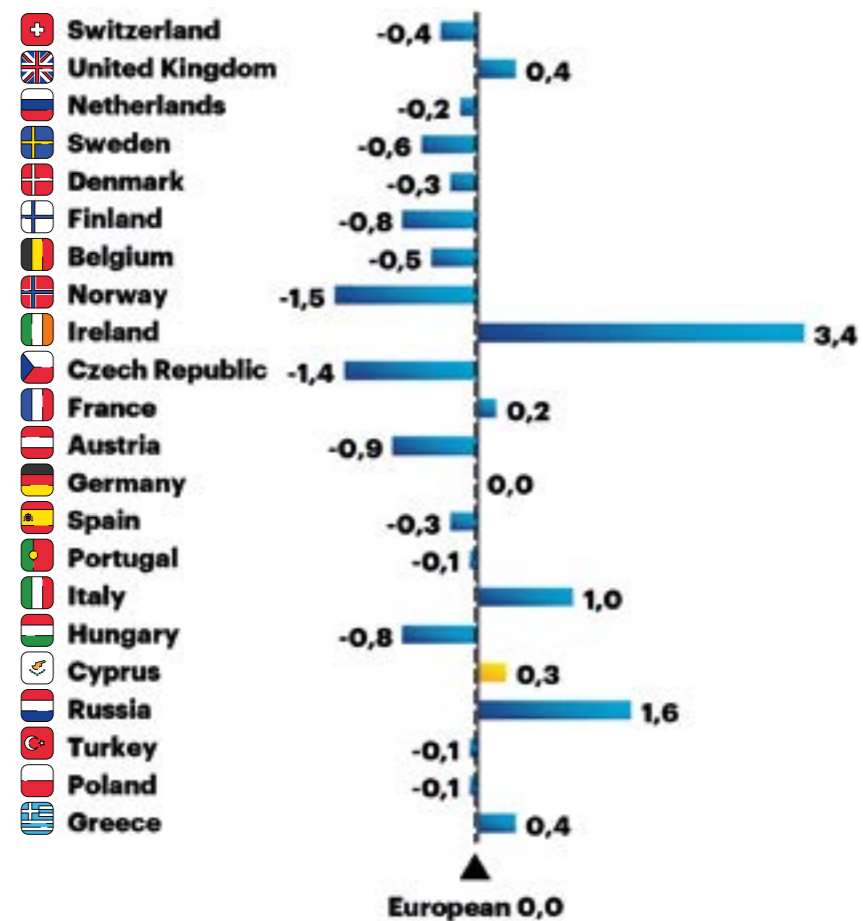


Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia.

Source: Oxford Economics, Accenture analysis

Figure 2.17. The digital economic opportunity index (DEOI) 2018, European sample (# out of 100) - The Digital Technologies lever

If we look at the evolution of Cyprus's maturity across the Digital Technologies lever, it is evident that over the last four years the Cypriot economy has started to acknowledge the importance of digital technologies. As such, inaugural steps have been made. This in turn has resulted in a moderate increase of Cyprus's score by 0,3 points over the past four years (see Figure 2.18).



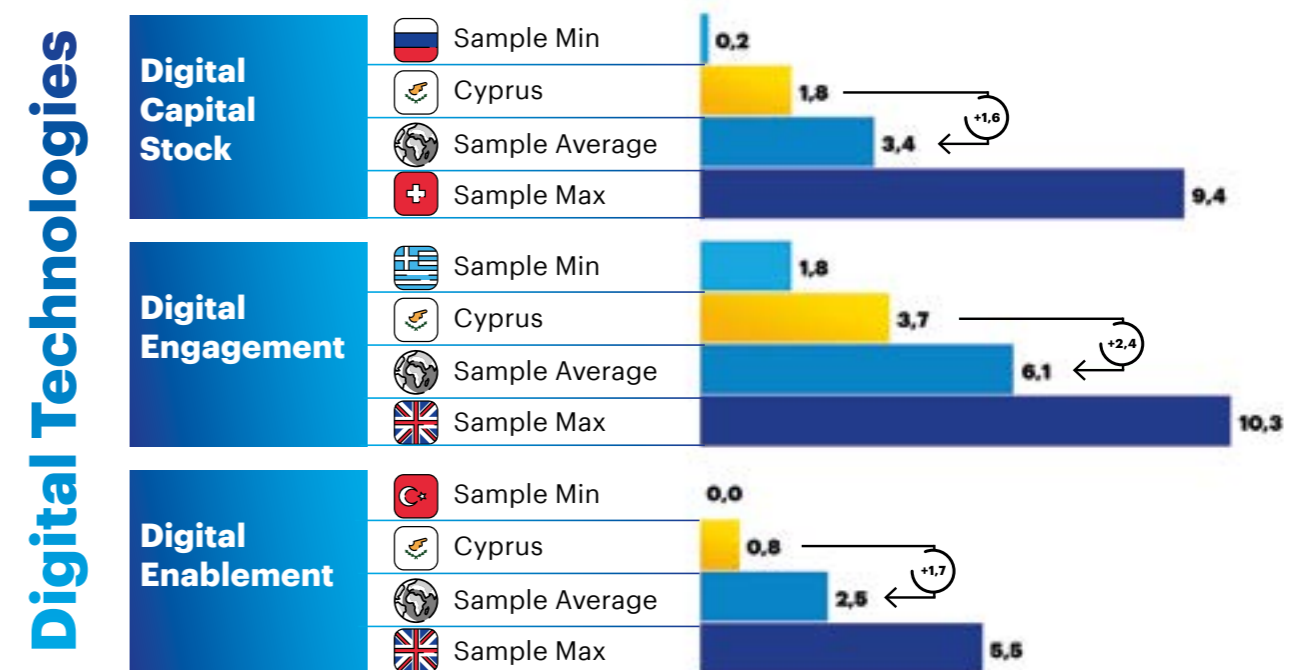
Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.18. The digital economic opportunity index (DEOI), European sample (# out of 100) - The Digital Technologies lever score evolution, 2015 - 2018

Worth noticing is that some of the countries that scored below the sample's average (i.e. Italy and Russia) also show a positive trajectory over the last four years. This indicates that less mature countries have started to step up efforts to adopt digital technologies.

If we further focus on the key dimensions of the Digital Technologies lever, it is evident that Cyprus's overall low score is mainly attributed to the country's low performance across its "Digital Capital Stock" and "Digital Enablement" dimensions. In other words, and most alarmingly, the Cypriot economy appears to invest significantly lower than the sample's average (1,6 points lower than the sample's average) in the acquisition and implementation of hardware

and software and has yet to become familiar with the usage and benefits of enabling digital technologies such as cloud-based services, big data analytics, and the Internet of Things (IoT) (2,4 points lower than the sample's average across "Digital Enablement"). With regards to the "Digital Engagement" dimension, Cyprus demonstrates a score of 3,7 points. However, this significantly lags behind the sample's average score (2,4 points lower) (see Figure 2.19).



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.19. The DEOI Digital Technologies dimension score, 2018 (# out of 100)

The low adoption of analytics and cloud computing capabilities by Cypriot companies ("Digital Enablement" dimension) is also highlighted by Eurostat data<sup>17,18</sup> (see Figures 2.20 & 2.21).

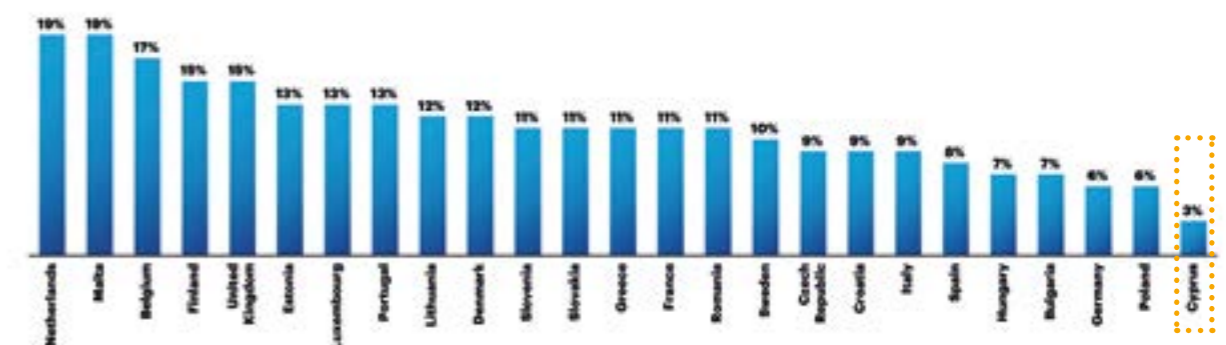


Figure 2.20. Enterprises leveraging big data Analytics Capabilities, 2016 (% of total enterprises)

17. Eurostat - Digital Economy and Society Database  
 18. Data refers to percentage of enterprises which are highly dependent on cloud services: [http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud\\_computing\\_-\\_statistics\\_on\\_the\\_use\\_by\\_enterprises](http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises)

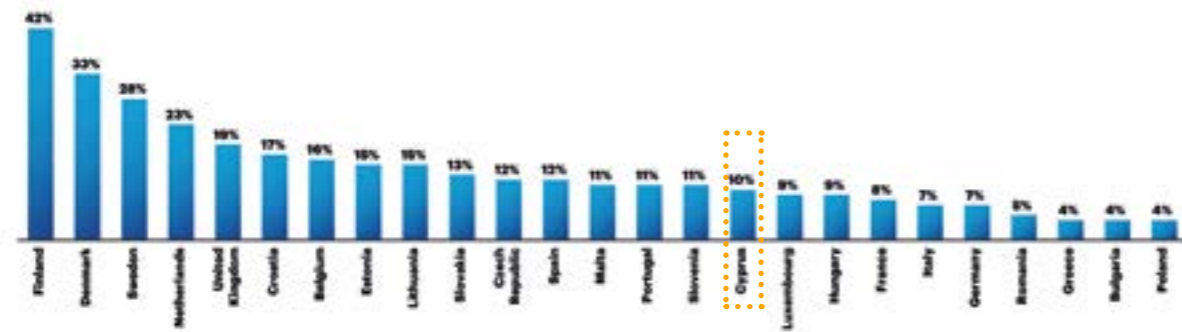
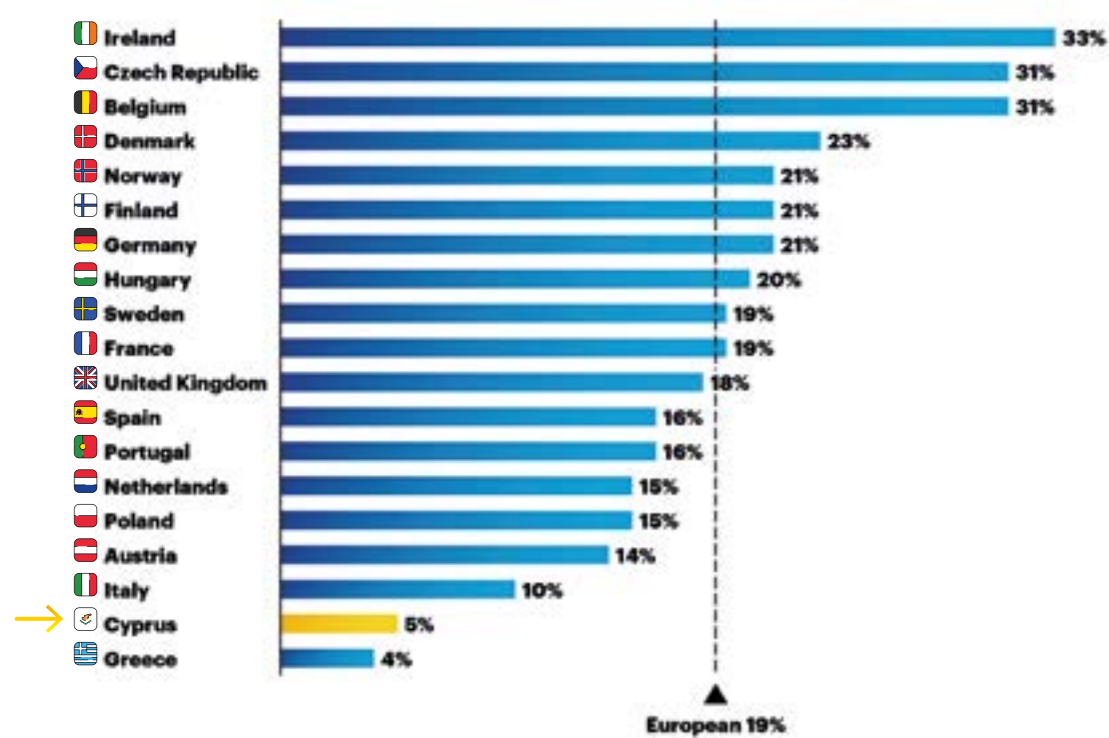


Figure 2.21. Percentage of Enterprises using cloud computing services, 2017 (%)

Moving to the “Digital Engagement” dimension, Cyprus significantly underperformed in the usage of collaborative applications and platforms, as well as with regards to investments in eCommerce<sup>19</sup> (see Figure 2.22).



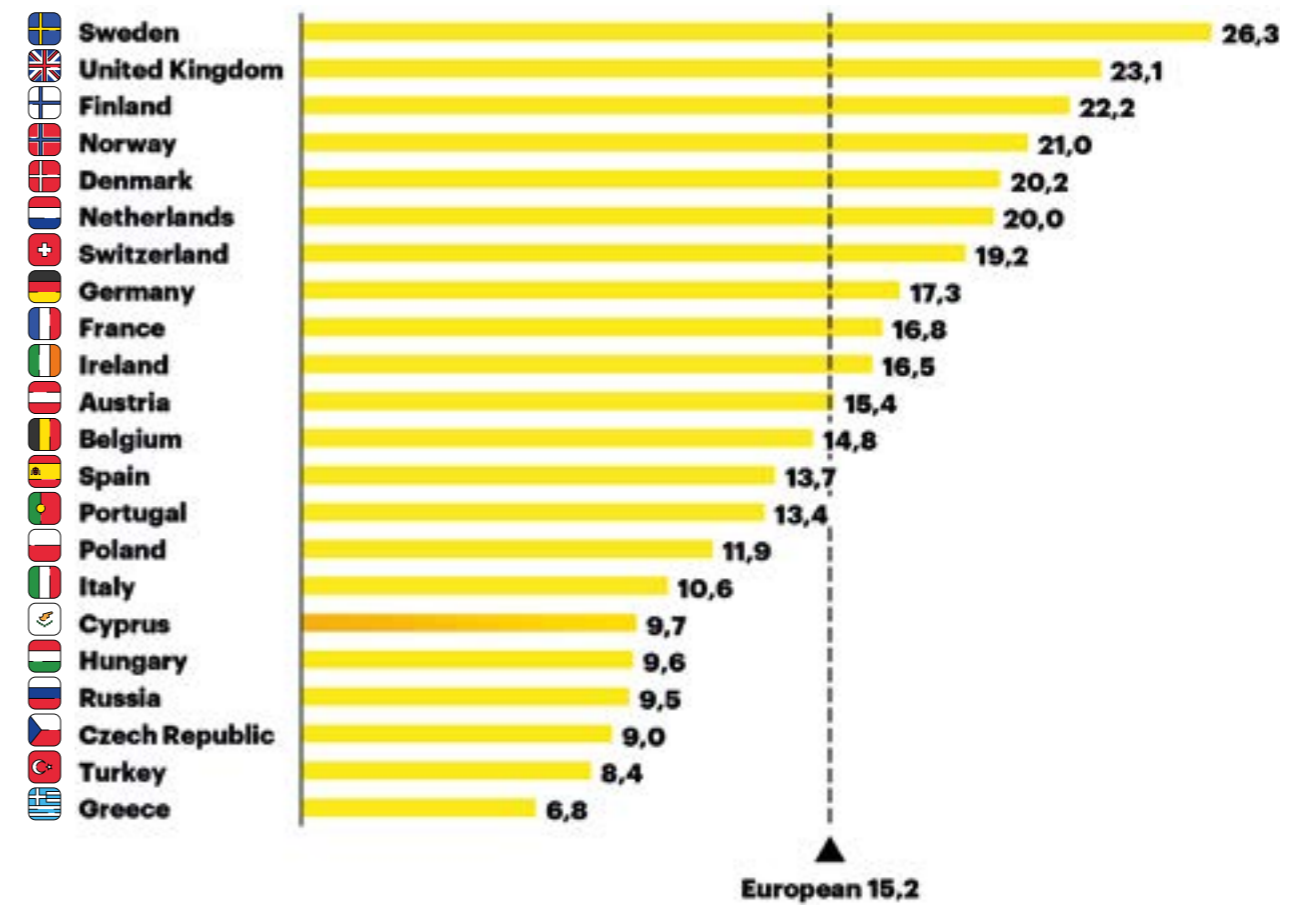
Source: Eurostat - Digital Economy and Society Database

Figure 2.22. Enterprises' total turnover from e-commerce, 2017 (% of total turnover)

19. Eurostat - Digital Economy and Society Database

## THE DIGITAL ACCELERATORS LEVER ANALYSIS

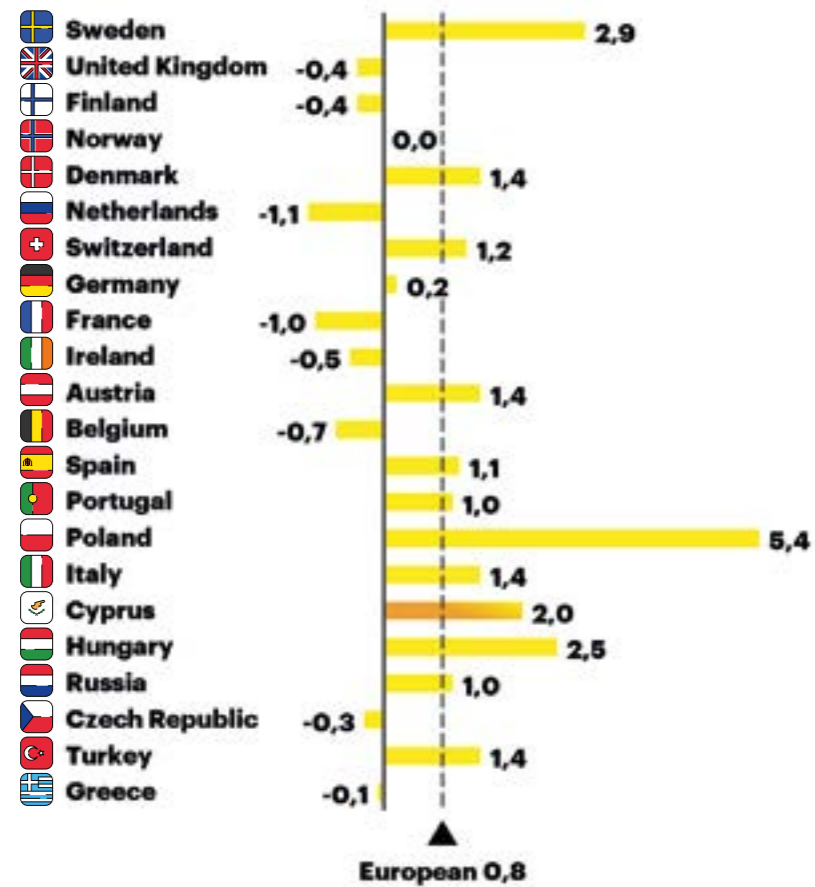
If we shift our focus to Cyprus's Digital Accelerators lever, we observe that the country scores at the lower ranks of the table (see Figure 2.23). In fact, Cyprus's 9,7 points position the country at the 17<sup>th</sup> place. The sample's average score (15,2 points) is also 5 points higher than the Cypriot. This indicates that the country lags behind its counterparts with regards to the provision of a digitally favorable business and regulatory environment.



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia.  
Source: Oxford Economics, Accenture analysis

Figure 2.23. The digital economic opportunity index (DEOI) 2018, European sample (# out of 100) - The Digital Accelerators lever

The significant increase of Cyprus's score from 2015 to 2018 by 2 points indicates that this has been acknowledged and acted upon (see Figure 2.24).

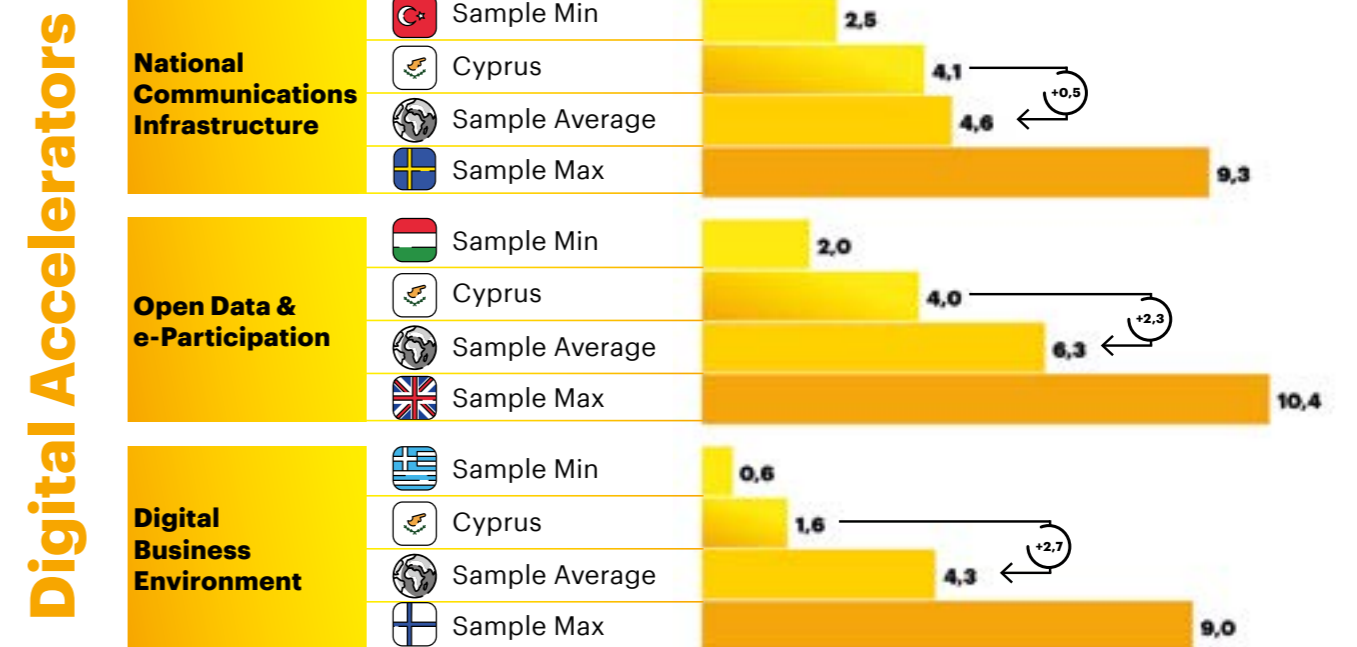


Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.24. The digital economic opportunity index (DEOI), European sample (# out of 100) - The Digital Accelerators lever score evolution, 2015 - 2018



With regards to its "National Communications Infrastructure" dimension (see Figure 2.25), Cyprus scores near the European average with 4,1 points. In fact, data testifies that Cyprus has demonstrated significant progress on that front in 2017. The country maintained in 2017 its fixed broadband and its NGA coverage to 100 percent and 88 percent of the Cypriot households respectively, while it improved its 4G geographic coverage from 64 percent in 2016 to 77 percent in 2017<sup>20</sup>.

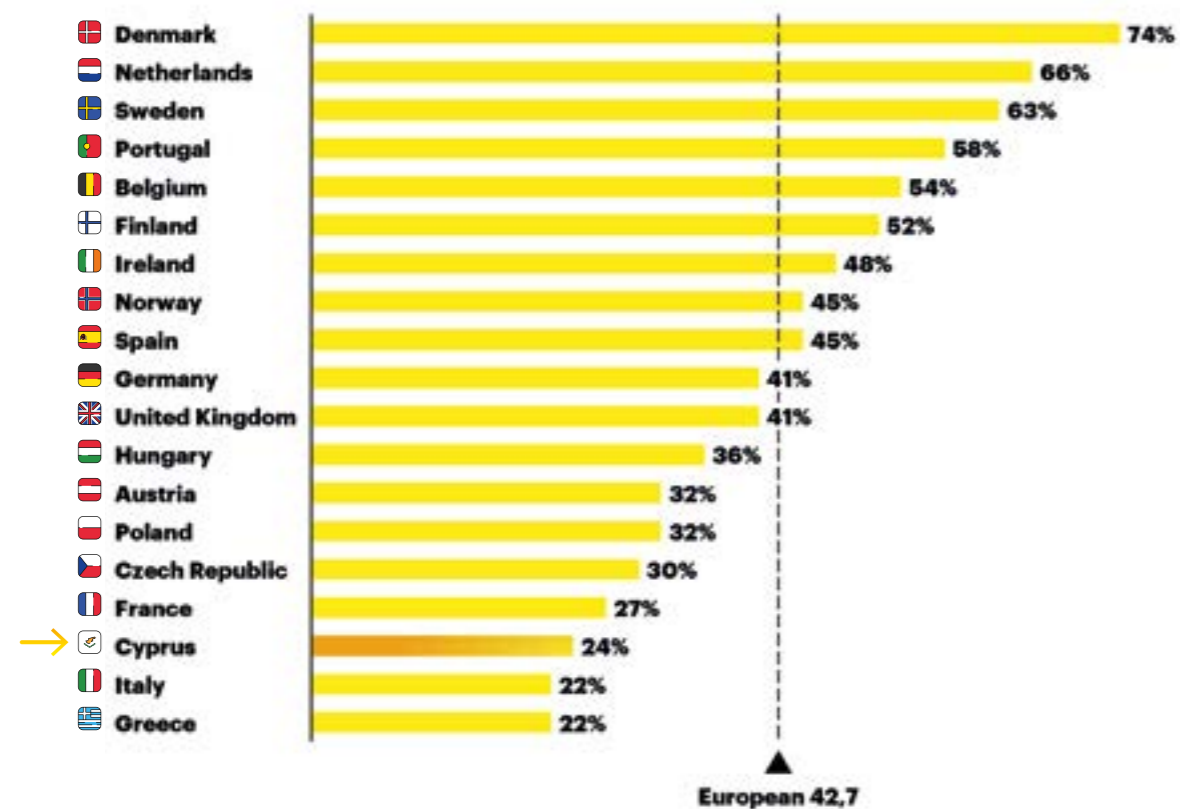


Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia. Source: Oxford Economics, Accenture analysis

Figure 2.25. The DEOI Digital Accelerators dimensions score 2018 (# out of 100)

20. Digital Economy and Society Index (DESI) 2018 Country Report Cyprus, [http://ec.europa.eu/information\\_society/newsroom/image/document/2018-20/cy-desi\\_2018-country-profile\\_eng\\_B43F6E93-DC41-A4D3-6FEDC85F4EC8246B\\_52217.pdf](http://ec.europa.eu/information_society/newsroom/image/document/2018-20/cy-desi_2018-country-profile_eng_B43F6E93-DC41-A4D3-6FEDC85F4EC8246B_52217.pdf)

Despite the manifested progress, the demonstrated willingness by the Cypriot economy to use this infrastructure remains limited. According to Eurostat, enterprises using high-speed fixed internet connections in 2017 was only 24 percent<sup>21</sup> (see Figure 2.26).



Zooming into the “Open Data and E-Participation” dimension, Cyprus’s low score indicates that additional emphasis should be given in order to further promote the digitalization of the Cypriot Public Administration and the provision of extended digital services to citizens and businesses alike.

In fact, testament of Cypriot citizens’ low participation and uptake of digital public services is Cyprus’s low position on the United Nations e-participation index. Cyprus scores below average relative to its EU peers<sup>22</sup> (see Figure 2.27).

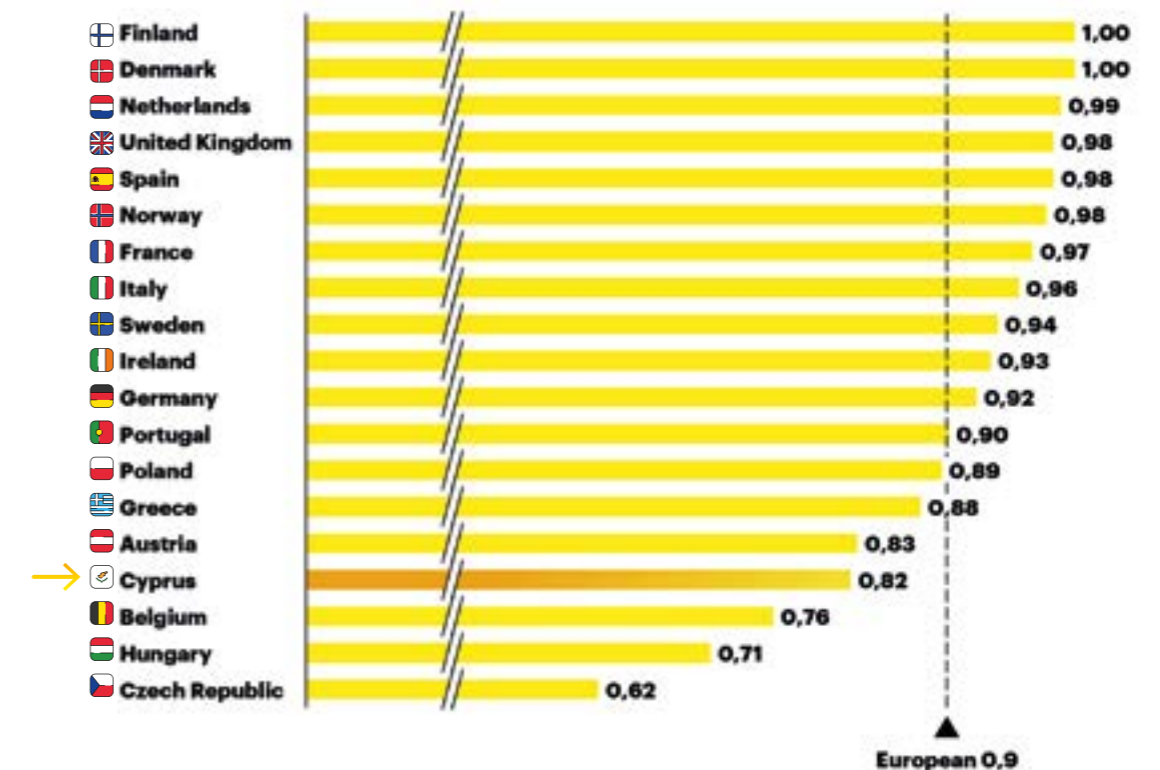


Figure 2.26. Percentage of enterprises using fast fixed internet connection, 2017, (% of enterprises with speeds >30MBPS)

Figure 2.27. United Nations e-participation index, 2018, (# out of 1)

21. Eurostat - Digital Economy and Society Database

22. E-Government Survey, UN, 2018, <https://publicadministration.un.org/egovkb/en-us/reports/un-e-government-survey-2018>

Finally, the establishment of a favorable institutional and regulatory environment for the digital economy is at a nascent state. This brings Cyprus to a 1,6-point score and 2,8 points behind the sample's average across the "Digital Business Environment" dimension. In fact, the World Bank has ranked Cyprus fifth from last position out of 28 European countries with regards to their "Ease of Doing Business"<sup>23</sup> (see Figure 2.28).

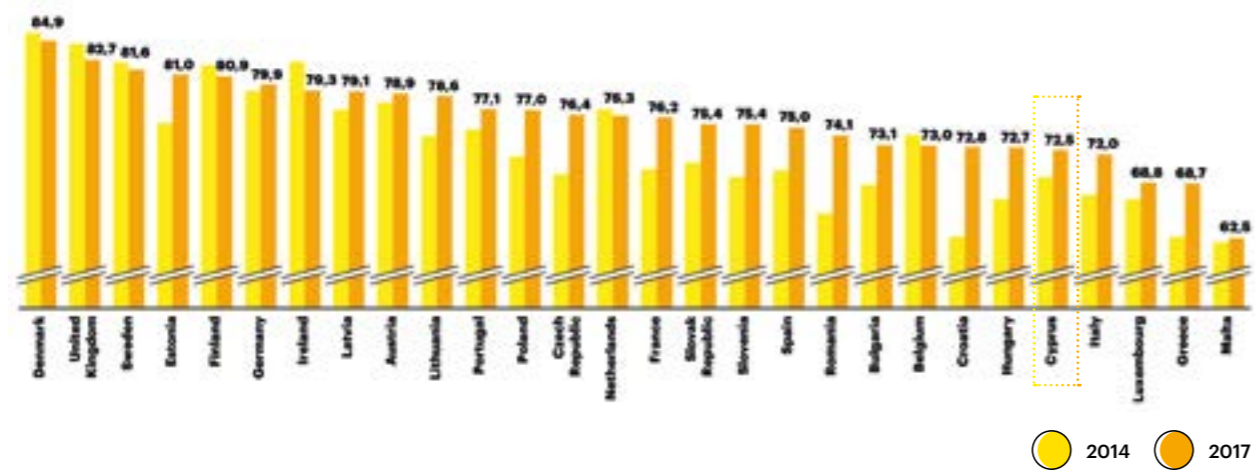


Figure 2.28. Ease of Doing Business index, 2014 & 2017(%)

At the same time, Cyprus in 2016 was rated by World Bank<sup>24</sup> with 3,93 points out of 7 with regards to the development of legislation relating to the use of Information and Communication Technologies (ICTs) (1 = not developed at all; 7 = extremely well developed) (see Figure 2.29).

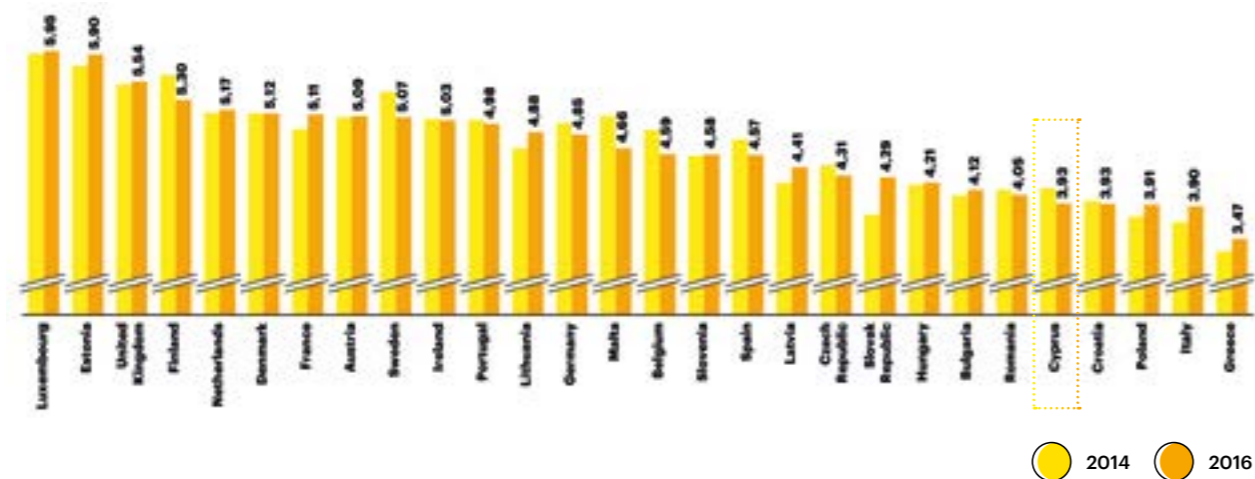
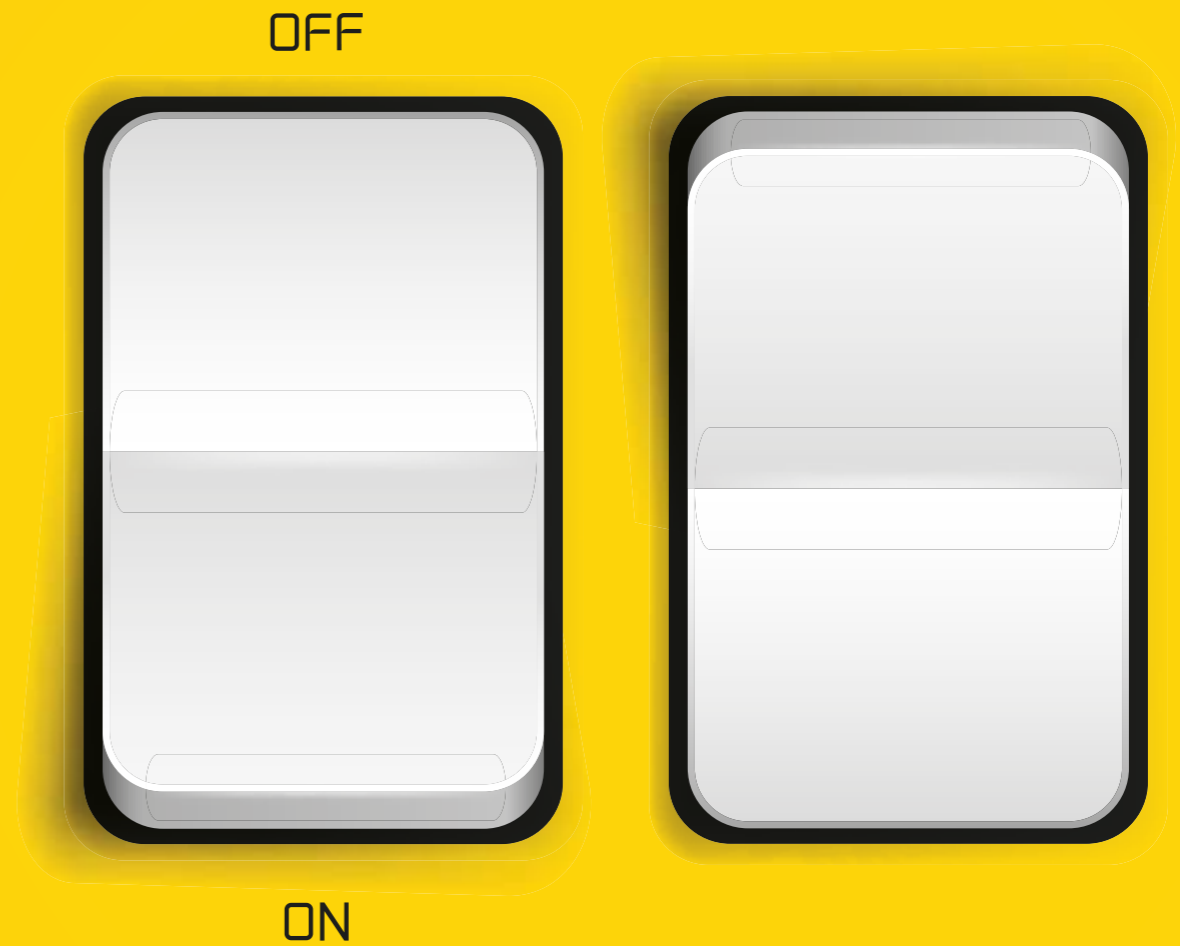


Figure 2.29. Development of legislation relating to the use of ICTs, 2014 & 2016, (#, 1-7)

Digitalization is an ongoing process that needs continuous investment both by the private sector and public administration stakeholders. The update of policies and regulations is an important part of this process.

23. The World Bank, Doing Business - Economy Rankings, <http://www.doingbusiness.org/rankings>

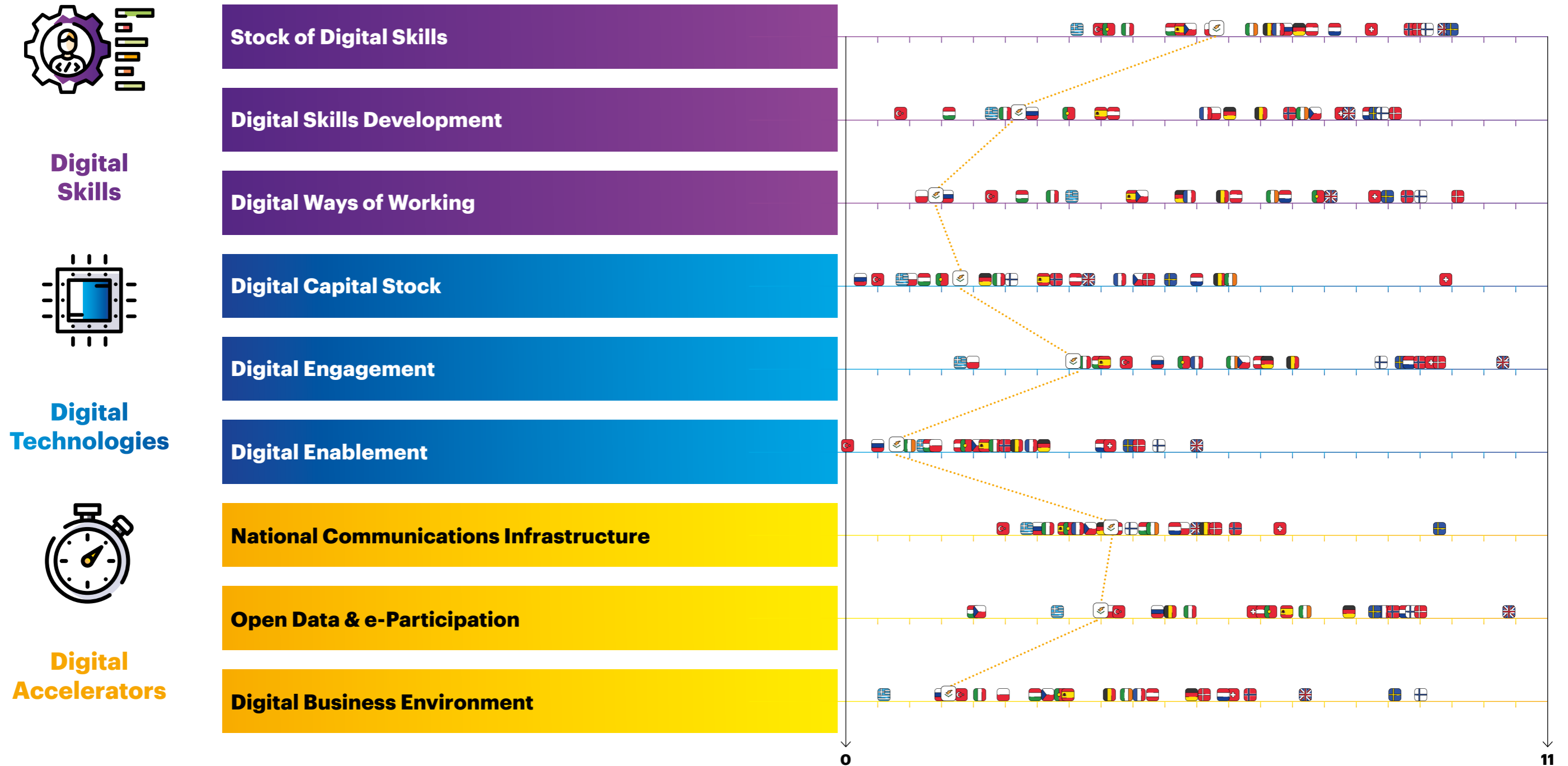
24. The World Bank, Laws relating to ICTs, [https://tcdata360.worldbank.org/indicators/entrp.ict.law?country=BRA&indicator=3367&viz=line\\_chart&years=2012,2016#table-link](https://tcdata360.worldbank.org/indicators/entrp.ict.law?country=BRA&indicator=3367&viz=line_chart&years=2012,2016#table-link)





Juxtaposing Cyprus's current digital maturity against our sample, it is evident that Cyprus scores at the lower end across all the digital maturity dimensions (Figure 2.30).

- Austria
- France
- Netherlands
- Sweden
- Belgium
- Germany
- Norway
- Switzerland
- Cyprus
- Greece
- Poland
- Turkey
- Czech Republic
- Hungary
- Portugal
- United Kingdom
- Denmark
- Ireland
- Russia
- Finland
- Italy
- Spain



Countries included in this sample refer to the broader European area. Turkey is included in our sample as a transcontinental country in Eurasia.  
Source: Oxford Economics, Accenture analysis

Figure 2.30. The digital economic opportunity (DEOI) index 2018 - dimensions presentation

## 2.5 ASSESSING THE DIGITAL MATURITY OF CYPRIOT INDUSTRIES

### THE PERCEIVED DIGITAL MATURITY OF THE CYPRIOT INDUSTRIES

According to the “Digital Capabilities” survey<sup>25</sup>, 74 percent of the surveyed executives recognize that their respective organizations have understood the significance of digital and demonstrate comparable capabilities to their competitors.

The stated ambitions are high. Over the next five years, the same executives expect their organizations to improve further (see Figure 2.31).

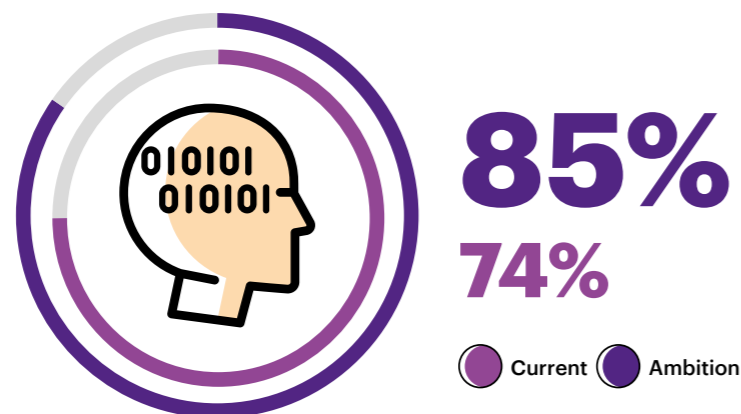


Figure 2.31. Executives' perception regarding the level of their organization's overall digital capabilities (on par or above global competition)

25. The performed analysis and the respective conclusions were based on data recorded through the “Digital Capabilities” survey ran by Accenture with more than 80 Cypriot executives across 11 key Cypriot industries, which was launched on July 13, 2017 and remained open until October 30, 2017

To achieve this, 86 percent of the Cypriot executives have stated that they have already designed a digital strategy within their organizations and feel ready to respond to the forthcoming digital challenges. In the near future, this percentage is expected to increase to 96 percent (see Figure 2.32).

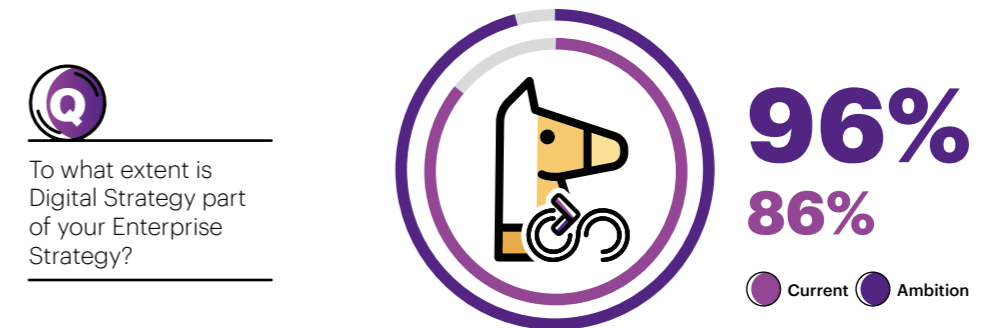


Figure 2.32. Executives' perception regarding the adoption of a digital strategy by their organization (on par or above global competition)

In order to implement their designed digital strategy, 70 percent of the interviewed executives have already translated their digital strategy into an actionable digital roadmap. Within the next five years, more organizations are expected to do so, reaching an overall 90 percent of the participative sample (see Figure 2.33).

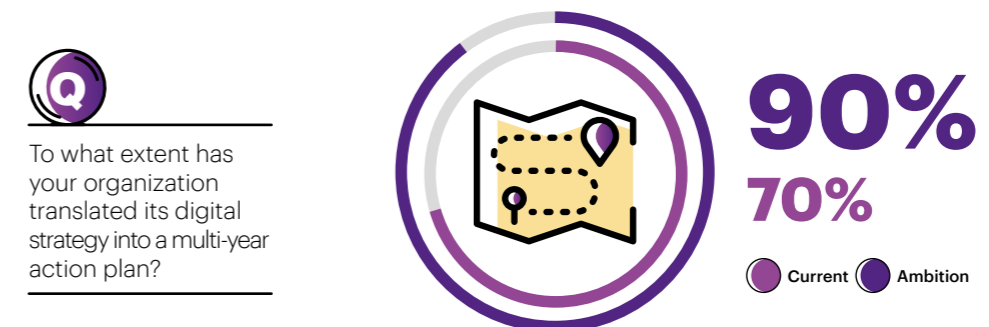


Figure 2.33. Executives' perception regarding the extent of digital strategy planning in their organization (on par or above global competition)

The majority of the surveyed executives believe that their organizations still lack the organizational and governance structures required for their digital transformation. In more detail, 72 percent of the surveyed Cypriot companies have yet to introduce new roles dedicated to their organization's digital rotation (i.e. Chief Digital Officer - CDO). In the next five years this is expected to be addressed by nearly 50 percent of the interviewed executives (see Figure 2.34).

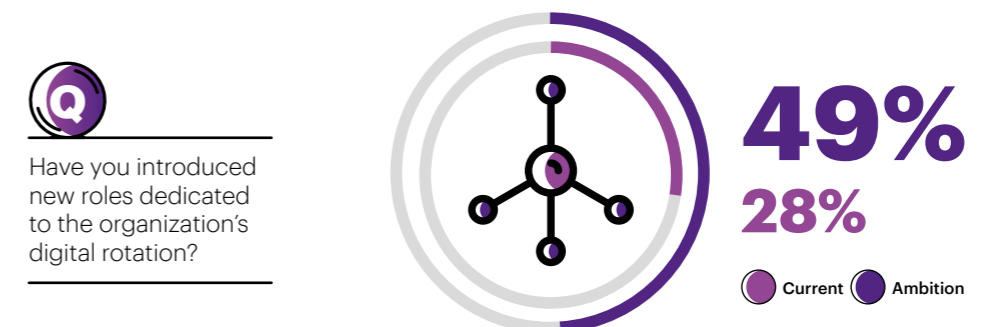


Figure 2.34. Percentage of Cypriot organizations that have a dedicated role responsible for Digital Transformation, as stated by the interviewed executives

With regards to their digital skills, at an aggregate level Cypriot executives see their organizations to perform on par with market. In more detail, 62 percent of them have stated that they have already identified the key competencies required for their digital transformation. Within the next five years, this percentage is expected to become 76 percent (see Figure 2.35).



Figure 2.35. Executives' perception of the extent to which their organization has identified the key competencies required for digital transformation (on par or above global competition)

At the same time, 73 percent of the executives consider that their organizations already have a plan in place with regards to the acquisition and development of the required digital skills (see Figure 2.36).



Figure 2.36. Executives' perception of whether their organization has a plan in place for Digital Skills required in the future

The adoption of digital technologies and specifically Big Data capabilities is an area highlighted for improvement for the majority of the Cypriot companies (see Figure 2.37).



Figure 2.37. Executives' perception of the extent to which their organization has defined analytics capabilities and a solid data strategy in place (on par or above global competition)

The same picture holds for the adoption of new, flexible IT services-based infrastructure, where 64 percent of the sampled executives aim to boost their investments with regards to their technology infrastructure in the future (see Figure 2.38).



Figure 2.38. Executives' perception of the extent to which their organization prioritizes investments regarding the adoption of flexible IT services-based infrastructure (on par or above global competition)

At an aggregate level, all surveyed executives perceive that their industries' digital maturity hovers well above the 60 percent mark. Within the sample, Communications, Natural Resources and Business Services & Technology consider themselves to be the most advanced. Retail and Chemicals & Refined Petroleum carry the highest ambitions for future improvements (see Figure 2.39)<sup>26</sup>.

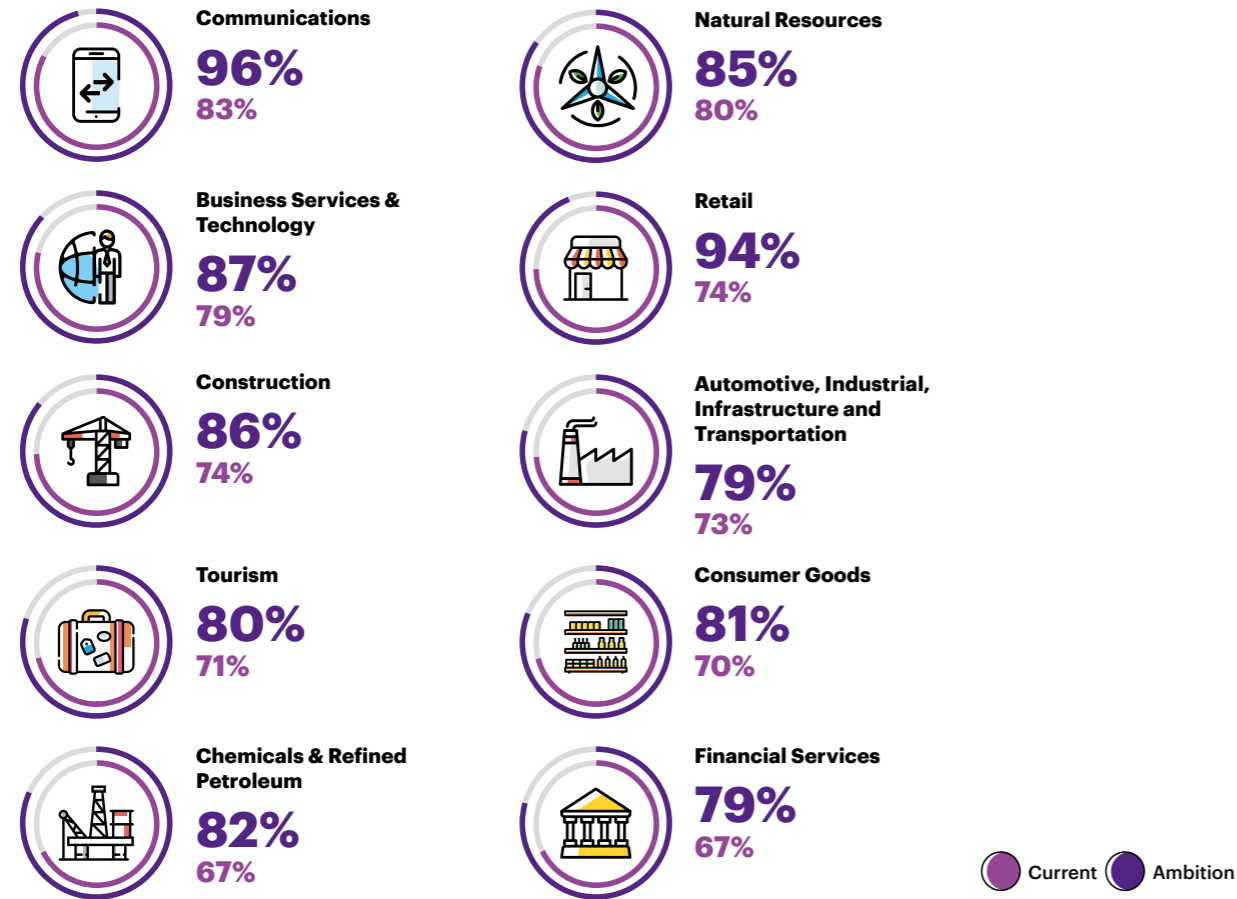


Figure 2.39. Overall Perceived Digital Capabilities of Cypriot Industries

## THE CALCULATED DIGITAL MATURITY OF THE CYPRIOT INDUSTRIES

Moving our analysis one step further, we overlaid "hard data" against the executives' opinions, in order to extract an additional layer of insight.

These results distinguish between perception and "hard data" and help uncover the digital gap between the intent and the actual outcome. At the same time, evidence suggests that the breadth and depth of the digital interventions required to be implemented by the Cypriot organizations shall be deeper and wider than initial estimations.

To achieve this, we applied the Digital Economic Opportunity Index (DEOI) for eleven select Cypriot industries over a four-year time period (2015 - 2018).

Our analysis suggests that all eleven Cypriot industries are suboptimally placed with regards to their digital maturity, when compared to their European peers over the last four years (see Figure 2.40).



Figure 2.40. European Industries' digital maturity ranking 2018

A detailed analysis on the calculated digital maturity of the select key Cypriot industries can be found in the "Digital Cyprus Industry Digital Potential" volume.

26. The detailed industry classification according to the NACE Rev. 2 classification of economic activities is presented in Appendix - Study Notes

## 2.6 SIZING CYPRUS'S DIGITAL ECONOMY

Cyprus's low digital maturity both at a national and at an industry level, points to a limited contribution of digital to the Cypriot economy. Accenture together with Oxford Economics has implemented the Digital Economic Value Index (DEVI) framework, to evaluate the total contribution of digital to the Cypriot economic output (Gross Domestic Product - GDP) and calculate the size of the Cypriot "digital economy".

### What is digital economy?

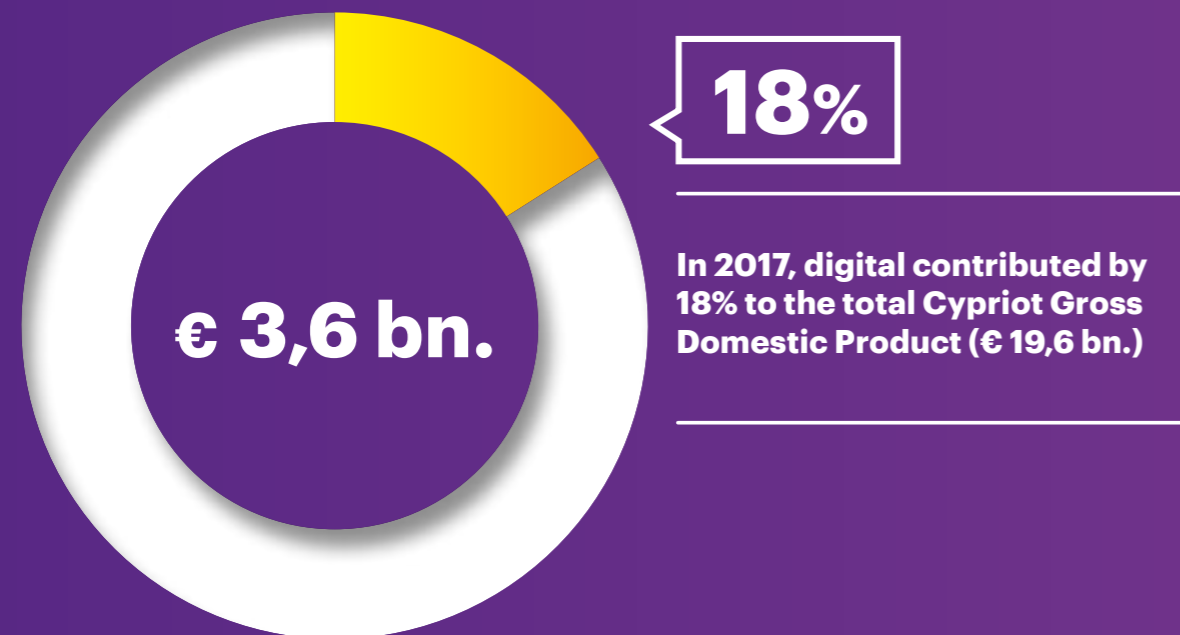
The digital economy is the share of total economic output derived from a number of broad "digital" inputs. These digital inputs include digital skills, digital equipment (hardware, software and communications equipment) and the intermediate digital goods and services used in production. Such broad measures reflect the foundations of the digital economy<sup>27</sup>.

The findings come as no surprise. Cyprus's low digital maturity leads to a limited value add on the Cypriot economy. This offers significant room for improvement with regards to the role and impact of digital within the Cypriot economy.

If we compare the Cypriot digital economy with a select subset of 10 other countries (European and other), Cyprus's limited capacity to develop its "digital economy" is evident. The country operates at a moderate 18 percent of its full digital potential, situated at the second from last position (see Figure 2.41).

Although digital pervasiveness is apparent across our sample, our analysis reinforces the fact that this is done at a "dual-digital speed". On the one side, digital frontrunners such as the USA, the United Kingdom and Australia help generate more than 30 percent of their GDP from digital inputs.

On the other side, we locate digital laggards, including Spain, Italy, Cyprus and Greece, where digital input contribution to the GDP is limited.



**IN 2017 DIGITAL CONTRIBUTED BY 18% TO THE TOTAL CYPRIOT GROSS DOMESTIC PRODUCT. THIS IS EQUIVALENT TO €3,6BN.**

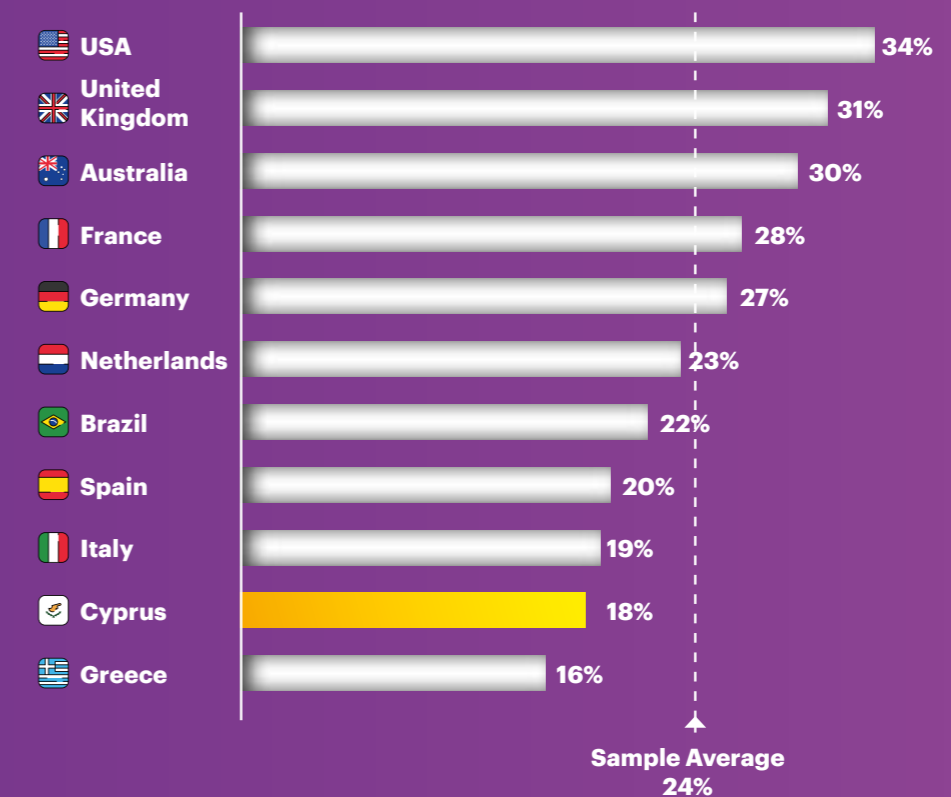


Figure 2.41. Digital Economy as a percentage of the GDP (2017)

<sup>27</sup> for further information on the methodology please see Appendix - Study Notes



## 2.7 CONCLUSION

Cyprus's digital anatomy surfaces a weak position for the country against its global and European peers. This unfavorable situation creates a burning platform for the nation and a pressing question is born:

**"Are we confronted with an inevitable future?"**

Hopefully, not. It is time for the country to define its national digital vision, architect an actionable digital plan and positively impact the growth of the country's GDP.

# 3. A DIGITAL VISION FOR CYPRUS



# 3.1 INTRODUCTION

During the last years, economies around the world struggle to achieve economic growth and ensure financial and social benefits for their populations. A high number of them continues to struggle with fiscal challenges, high unemployment, social inequalities, and fights to ensure economic growth and sustainable gains. In this context, countries have started to warm up to the fact that the transformative forces of digitalization sit at the heart of achieving reform. Namely, to deliver economic growth, social progress, and secure their nations.

According to the World Economic Forum and Accenture analysis<sup>1</sup>, the digital transformation across countries and industries is estimated to provide \$100 trillion in net benefits for society and industry by 2025. In addition, digital technologies act as an accelerator of social development and transformation by improving access to basic services, enhancing connectivity, and creating new employment opportunities.

Countries across the world have already started to build and implement their digital agendas. Yet many ask, is there a “tried and tested” strategy that can be emulated across the world?

The answer is no. Countries build differentiated national digital strategies on the basis of their own digital maturity levels and in accordance to their respective economic strength and different social context. All these factors shape the nations’ strategic vision and influence their drive towards digitalization.

At the same time and despite the great differences observed between countries’ strategies, global experience points to three overarching narratives, based upon which national digital strategies are formed.



# 3.2 THE THREE DIGITAL NATION TRANSFORMATION NARRATIVES

## DIGITAL AS A “COST OPTIMIZER”

For countries that seek to impart fiscal discipline into their national budgets, digitalization is a key factor for their transformation. For them, digital interventions help them drive cost efficiencies, cut the red tape, reduce their government expenditure and balance their budgets.


These countries put additional emphasis on the development of nation-wide infrastructures and the adoption of the underpinning technologies. Robust digital infrastructures and the adoption of digital technologies act as the backbone for the introduction of unified and convenient single points of access for citizens and businesses alike. In addition, the removal of redundant or duplicative government functions and the shifting of high-volume transactional services (i.e. pensions and taxes) towards digital provide them with significant efficiencies and help reduce the red tape.


Since productivity and cost-efficiency are two of the key drivers on the political agenda, countries that adopt this narrative, strive to become “digital by default”; in other words, they promote and enforce digital channels as the preferred access mode for all major services. This is their first key milestone. Once all major transactional and high-volume services are primarily delivered through digital channels, these countries shift their focus on two different directions: Firstly, they enhance their efforts toward digital inclusion and literacy. This allows all segments of the population to “new-skill” themselves, in order to effectively operate within the new digital society and economy. Then, they move towards the “i-government” paradigm. The aggressive deployment of digital technologies within and across the Public Administration becomes the focal point of their attention.

1. World Economic Forum and Accenture, “Unlocking \$100 Trillion for Business and Society from Digital Transformation,” January 2017, [https://www.accenture.com/t20170116T084450\\_w/us-en/\\_acnmedia/AccentureConversion-Assets/WEF/PDF/Accenture-DTI-executive-summary.pdf](https://www.accenture.com/t20170116T084450_w/us-en/_acnmedia/AccentureConversion-Assets/WEF/PDF/Accenture-DTI-executive-summary.pdf)




### Leading Practices

 During the previous years, France built its national digital narrative on the back of a set of austerity measures, driving a clear vision for increasing government efficiency and reducing public spending. At the same time, the French Digital Strategy aimed to increase citizen satisfaction through the provision of high-quality, transparent digital services and through the engagement of citizens in large scale national consultation councils.


 UK's "Digital by Default" digital strategy that is bringing the most popular government services online and making their use mandatory. This was also driven by austerity measures and the need for cost efficiency in service delivery. In fact, it was estimated that moving to digital by default could potentially save the British Government from £1.7 billion to £1.8 billion every year.

Sources: RGPP (*Révision Générale des Politiques Publiques*), Accenture Research, <https://www.gov.uk/government/publications/digital-efficiency-report/digital-efficiency-report>

### Leading Practices

 In 2016, Denmark, one of the global digital frontrunners, introduced a digital welfare strategy that included a set of initiatives with regards to the adoption of digital in education, training, care giving and health to drive digital inclusiveness.

 In 2016, Estonia published its Digital Agenda 2020, in which two out of its five pillars refer to the themes of digital inclusion and digital literacy.

 In 2017, the United Kingdom revamped the national digital strategy and placed significant emphasis in giving everyone access to the digital skills they need. This would help make the UK the best place to start and grow a digital business and to help every British business become digital.

Sources: <https://www.digst.dk/ServiceMenu/English/Policy-and-Strategy/Digital-Welfare-2016-to-2020>, [https://www.mkm.ee/sites/default/files/digital\\_agenda\\_2020\\_estonia\\_engf.pdf](https://www.mkm.ee/sites/default/files/digital_agenda_2020_estonia_engf.pdf), <https://www.gov.uk/government/publications/uk-digital-strategy>

## DIGITAL TO "FOSTER SOCIAL INCLUSION & OPPORTUNITIES FOR GROWTH"

Several countries have already embraced new technologies and appear to be well on their way to digitalization. Current performance though, is no indication of future performance. On the contrary, to sustain their edge these countries re-evaluate their digital agendas, calibrate their strategic intent and continue to adopt the pervasive and immersive use of digital technologies. This is actively supported by their national ICT sector.

These countries on average, demonstrate high GDPs and low public deficits. They have initiated their digital transformation some years ago and are often seen as the digital leaders. These countries have already in place an up-to-date infrastructure that enables ubiquitous high-speed connectivity, a digitally skilled and engaged population and a digitally advanced economy that has seamlessly incorporated new technologies in its modus operandi.

The challenge for countries in this group is multiple. Namely, to leverage digital and to drive greater citizen engagement, to increase digital literacy and to ensure higher engagement and inclusiveness in their societies and economies. At the same time, they focus on creating the right conditions for the growth of the ICT sector as an enabler of other industries' digitalization.

In more detail, digital leaders enhance their efforts to increase citizen engagement. They involve citizens in a more consultative process of policymaking and service delivery. They heavily invest in their population's digital upskilling and reskilling, as they recognize the digital-ready human capital to be a prerequisite for innovation and growth. They enable cross-government collaboration and stretch to include the private sector in the delivery of existing and new services.

## DIGITAL AS AN "ENABLER OF TRANSFORMATION"


Finally, we observe a third set of countries that have either outlived or have not been severely impacted by the financial turbulence.


They are usually a small to medium size in terms of their population, with robust economies and lean structures. Their specific economic and demographic attributes are indeed their competitive advantage. These countries have quickly deployed a modern, nation-wide, information and communications technology infrastructure. Also, their Public Administrations' lean structure has enabled the rapid digitalization of targeted public services for both the public and the businesses alike (i.e. applying for a job, submit a house request, authorization of customs clearance companies, etc.). In addition, they already work to promote the adoption

of ICT through the formulation of appropriate policies and regulations. To that end, they have built respective agencies, that are responsible to monitor local and international development trends and to ensure that the relevant policies and frameworks are effective and continuously updated.

One key challenge for these countries is the limited digital awareness and literacy demonstrated by their human capital. For this reason, they typically undertake a "whole-of-nation" and outcome-driven approach that aims to encourage the mass adoption of digital.

### Leading Practices

 In 2014, Singapore launched its national digital agenda (2015-2020) to harness IT & Communication networks and data to support better living, create more opportunities and support stronger communities. (PM Lee Hsien Loong, Smart Nation Launch, Nov 2014)

 In the same year, Dubai has set out its 2021 plan (2015-2021) to propel itself and reinforce its position as a pivotal hub in the global economy and as a preferred place to live and work. Its people-first digital agenda focused on sustaining economic growth and was anchored around digital government. (HH Sheikh Mohammed Bin Rashid, Dubai Plan 2021 Launch, Dec 2014 )

Sources: <https://www.smartnation.sg/happenings/speeches/smart-nation-launch>,  
<http://www.emirates247.com/news/government/mohammed-launches-dubai-strategy-2021-2014-12-17-1.573780>



## 3.3 DEFINING A DIGITAL VISION FOR CYPRUS

Amidst this digital revolution, we find that Cyprus has initiated its own digital journey. Our analysis suggests that there is still significant room to cover, in order to take advantage of the opportunities that digital offers.

Cyprus's unique attributes (demographics, size and financial outlook) enable the country to be quicker and more effective in the way it will manage an accelerated digital rotation. Nevertheless, success in the digital era will require the country to shift gears.

Industries are asked to assume a leadership stance within the Cypriot economy. Their rotation to digital is of pivotal significance towards Cyprus's transformation. The digital progress noted over the last years is an encouraging sign and a bold step to the right direction. This must continue.

In parallel, the Public Administration has also a dual role to play: It shall adopt digital for its internal reorganization. At the same time, it shall carry the responsibility to act as the "digital enabler" for the Cypriot economy and society.

## A DIGITAL VISION FOR CYPRUS

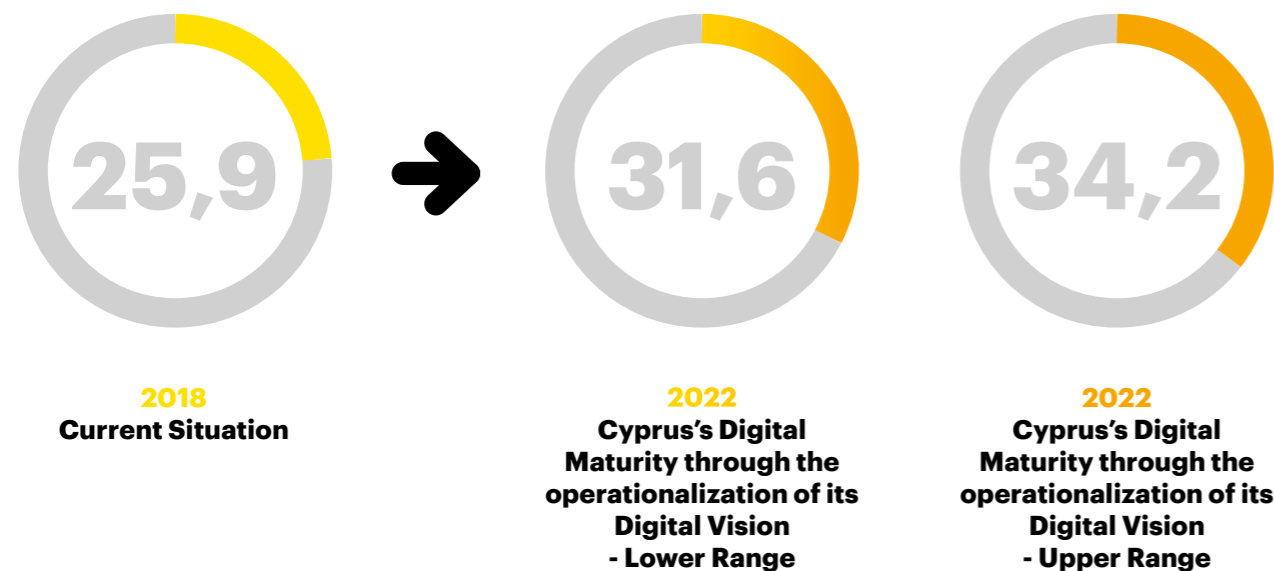
**Position Cyprus at the core of the European Digital Economy & Society, by driving the mass adoption of digital, crafting new relationships between the industries and placing the Public Administration as the digital catalyst to elevate productivity and competitiveness at an industry and a national level.**

# 3.4 A DIGITAL VISION FOR CYPRUS- THE GROWTH MULTIPLIER FOR THE CYPRIOT ECONOMY

The operationalization of Cyprus's Digital Vision aims to improve the country's digital maturity, increase the productivity and uplift the country's gross domestic product. In short, Cyprus's digitalization will act as a growth multiplier for the Cypriot economy.

Our analysis indicates that the operationalization of the Cypriot Digital Vision is estimated to increase Cyprus's digital maturity index (DEOI index) between 5,7 and 8,3 points by the year 2022<sup>2,3</sup>.

## CYPRUS'S ESTIMATED DIGITAL MATURITY IN 2022

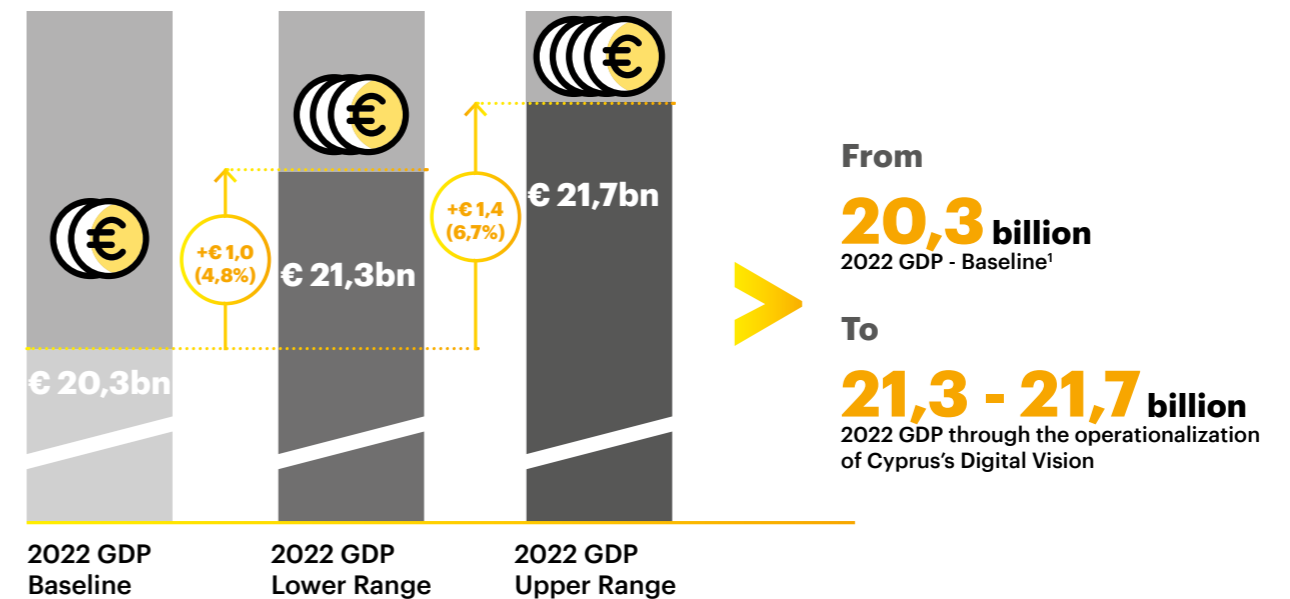


Cyprus's upward movement on the digital indexes albeit important, should not be perceived as an end in itself. What is of essence, is the value creation that will be generated as the result of the vision's operationalization. Based on this principle, we identified that there is a clear link between countries' digital maturity indexes and their respective productivity growth rates. This link subsequently leads to improvements in the countries' economic performance and gross domestic product (GDP).

2. On a 100 scale  
3. Further information on how the operationalization of Cyprus's digital vision is linked to the increase of Cyprus's digital maturity can be found in the Study Notes section

In this context, the projected increase in Cyprus's digital maturity is expected to have a direct impact on its GDP in the range of 4,8 to 6,7 percent. This equates to a corresponding GDP uplift in 2022 from 1 billion to 1.4 billion euros<sup>4</sup> (see Figure 3.1).

## GDP Uplift in 2022: €1,0 - 1,4 bn



<sup>1</sup> Estimated GDP value. GDP forecasts created by using Eurostat 2016 data and applying Oxford Economics forecasted growth rates. 2022 GDP Baseline forecast embeds all macroeconomic variables used by Oxford Economics (including digital maturity)

Figure 3.1. 2022 GDP Uplift (in Euros and percentage increase)

4. Further information on the link between the Digital Maturity index, the GDP growth rates and the required investments is provided in the Study Notes section

# 3.5 A DIGITAL VISION FOR CYPRUS- THE THREE STRATEGIC GOALS

To effectively execute the digital vision and achieve the estimated economic growth, Cyprus shall structure its efforts and act towards the accomplishment of three goals. These goals are interconnected and when realized in tandem, they are expected to accelerate the nation's digital rotation. The three goals are the following:

- ▶ “Graduate” from setting the foundations
- ▶ “Drive” mass adoption of digital
- ▶ “Architect” new relationships

## THE 1<sup>ST</sup> GOAL - “GRADUATE” FROM SETTING THE FOUNDATIONS

Cyprus has already made progress and a set of fundamental initiatives are in place. These form the starting point for the country's digital transformation. It is now time for Cyprus to “graduate” from these and drive the mass adoption of digital across the nation. As such, Cyprus shall:

- ▶ Accelerate the completion of the deployment of nation-wide NGA access networks
- ▶ Exploit Open Data
- ▶ Revamp and enforce “smart” cybersecurity and ePrivacy policies and standards
- ▶ Ensure that the key enablers are in place

## ENSURE DIGITAL CONNECTIVITY

In the new digital era, internet connectivity has become a utility, and the rotation to digital is impossible without it. Connectivity drives productivity and innovation and plays a critical role for countries that move towards becoming digital nations. Countries' successful digital transformation is not underpinned only by the provision and access to an up-to-date ICT infrastructure. The high level of ICT usage and the intent to use it effectively are of equal importance for the nation's digital rotation. Therefore, digitally advanced countries have already undertaken a balanced approach towards enhancing their ICT access and motivating the ICT use.

Cognizant of the above, the EU Commission proposes that by 2025 all schools, transport hubs and main providers of public services as well as digitally intensive enterprises should have access to internet connections with download/upload speeds of 1 Gigabit of data per second. In addition, all European households, rural or urban, should have access to networks offering a download speed of at least 100 Mbps, which can be upgraded to 1 Gigabit. All urban areas as well as major roads and railways should have uninterrupted 5G wireless broadband coverage, starting with fully-fledged commercial service in at least one major city in each EU Member State already by 2020<sup>5</sup>.

Following the EU's directions, Cyprus has committed that by 2020 the country will achieve 100 percent coverage with 30Mbps and 50 percent penetration of households and enterprises with at least 100Mbps. In order to achieve these ambitious targets, the Department of Electronic Communications (DEC) under the Ministry of Transport, Communications and Works published in 2016 the “Cyprus Broadband Plan 2016-2020”. The plan covers the key intervention areas across which both the private and public sector shall act to improve Cyprus's increased high-speed connectivity.

Due to infrastructure's critical role as a key enabler, Cyprus shall further accelerate its efforts in this area and intensify the deployment of ultra-high-speed networks through the modernization of its broadband infrastructure. For this, the private sector shall join forces with the Public Administration and implement a set of targeted, infrastructure-oriented initiatives to secure Cyprus's competitiveness.

In terms of the provided access to fixed broadband networks, Cyprus has already demonstrated significant progress since 2016 maintaining a total coverage (100 percent) of fixed broadband networks. At the same time it increased its NGA coverage to almost three quarters of the Cypriot households (88 percent). This percentage is slightly lower for the Cypriot rural areas where 75 percent is thus far covered<sup>6</sup>. With regards to the 4G coverage, it appears that significant improvements have taken place; according to the latest data, by end of November 2017, a 79 percent geographic coverage and a 95 percent household coverage has been achieved (EU average household coverage is 91 percent)<sup>7,8</sup>. By end of January 2018, the respective numbers were increased to 83 percent and 97 percent respectively.

The deployment of a high-speed backhaul is a long-term and high-capital investment. For this reason, regulatory uncertainty can become an obstacle to infrastructure roll-out. In this context, it is important that relevant regulatory frameworks are designed and reviewed to ensure they promote stability and predictability of regulation and its implementation. In more detail, the deployment of a clear and flexible regulatory framework should cover explicitly the role that the Government shall play with regards to the support to be provided for the deployment of high-speed infrastructure. In addition, the framework shall prescribe flexible models of cooperation, where telecommunications operators can work with the Government and the local authorities to achieve an accelerated licensing process to favor

5. <https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access>

6. Data provided by Cyprus Telecommunications Authority (CYTA) on 11/01/2018

7. Data provided by Cyprus Telecommunications Authority (CYTA) on 11/01/2018

8. [http://ec.europa.eu/newsroom/dae/document.cfm?doc\\_id=52254](http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=52254)

the rapid deployment of NGA infrastructures. A positive step towards this direction has been taken through the transposition of the Broadband Cost Reduction Directive through the Regulation of Electronic Communications and Postal Services (Amendment) Law in 2016<sup>9</sup>.

It is important to note that public support shall avoid having an inhibitory effect on infrastructure deployment in areas where private entities plan to implement investments. The role of the Government shall be supportive of private investments that will provide tangible support towards the expansion of infrastructure without violating the principles of competition.

Data also indicates that price levels with regards to fixed and mobile broadband connections remain relatively high<sup>10</sup>, although last year they recorded a significant decrease. High prices may be one of the key inhibitors that contribute to the low high-speed broadband take-up rates. It should also be noted that low population density and city planning often lead to higher cost of infrastructure which can be reflected in relatively higher prices.

Thus, it becomes an imperative to support and incentivize the upgrades of existing infrastructure to the new NGA networks. Allowing for an extended investment recovery period to facilitate further the cost-orientation in prices during the service transition from the copper

to the fiber network and/or allowing for total fiber replacement of the copper network on a timeframe that will support the efficiency of the investment can also be a potential solution.

With regards to spectrum allocation, Cyprus has assigned 44,5 percent of the overall harmonized spectrum for broadband, compared to 69 percent EU-wide. The main reason for the low percentage of assigned spectrum can be attributed to the lack of commercial interest for some frequency bands, partially due to the small size of the market<sup>11</sup>.

At the beginning of 2016, Cyprus launched a competitive procedure to assign radio frequency rights of use in the 800 and 2600 MHz bands.

To further exploit the spectrum and stir additional demand for its use, the Public Administration shall:

- ▶ accelerate the authorization procedure of the available spectrum
- ▶ review the utilization of its frequency bands
- ▶ identify those that are underutilized or that could be potentially shared, or reallocated to different uses
- ▶ define new highspeed, wireless services that will use the available spectrum and add value to the Cypriot society

The reallocation of the required spectrum however is a necessary but not sufficient condition for the deployment of the 5G network. The active collaboration between the Cypriot Public Administration and the private sector and academia is expected to generate a set of initiatives that will be incorporated in Cyprus's broadband plan and will accelerate the deployment of the 5G network.

In November 2017, UK launched a relevant financial scheme to boost broadband connectivity for businesses.

### **United Kingdom - Voucher scheme to boost broadband connectivity for Businesses**



Telecom suppliers offer vouchers worth between £500 and £3000 to local businesses, which can then be used to pay for the installation of gigabit speed connections. The aim of this initiative is to encourage the market to extend full fiber infrastructure across the UK. This is expected to increase demand and to reduce the cost to customers.

Key benefits that stem out of a full fiber gigabit connection include:

- ▶ allowing businesses to upload and download massive files in a matter of seconds
- ▶ enabling the widespread use of videoconferencing throughout an organization
- ▶ allowing businesses in remote communities to compete on an even technology playing field with those companies based in major cities who may already have full fiber connectivity

Minister for Digital Matt Hancock stated: "A world-class digital communications network is essential to ensure the UK's future competitiveness in the global market and its ability to attract investment. Faster and more reliable connections are transforming the way we live and work, and better broadband supports businesses to grow and become more productive. These voucher pilots, alongside a range of other actions, are testament to Government's ambition for full fiber infrastructure across the UK to underpin our digital economy."

This program is part of the government's £23 billion National Productivity Investment Fund aimed at improving productivity. This fund has already earmarked £740 million specifically for improving Britain's digital infrastructure, ensuring that the UK is match-fit for the future.

Source: <https://www.gov.uk/government/news/broadband-boost-for-businesses>

9. DESI Report 2018 - Telecoms Chapters, <https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus>

10. *ibid*

11. DESI Report 2018 - Telecoms Chapters, <https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus>

## CREATE SMART REGULATION & POLICIES FOR THE FUTURE

### TAKE OPEN DATA OFF THE BENCH AND INTO THE GAME

Data is the 21<sup>st</sup> century's new raw material. It has great power to provide transparency, drive choice and improvements in public services. One of the most valuable types of data is the open, public data; namely all the information that public entities produce, collect or pay for. Examples are geolocation data, country-wide statistics, weather data, data from publicly funded research projects, environmental data etc. This information has a significant potential for re-use as an integral component for the design of new products and services.

In 2017, Cyprus registered progress in the "chapter" of open data. According to the European Data Portal, Cyprus has implemented fundamental activities with regards to its Open Data policies and regulatory framework<sup>12</sup>. In more detail, Cyprus introduced a dedicated Open Data Policy and has established a national coordination mechanism for the successful management and provision of Open Data at a national level.

With regards to the licensing policies required to determine the terms and conditions for the re-use of Open Data, Cyprus currently provides more than 80 percent of their data with an open license. Having said this, the absence of a comprehensive Freedom of Information Act stands as a potential barrier for disclosing additional sources of information.

In addition, over the last two years, the Cypriot Public Administration has redesigned the national Open Data portal and now provides additional functionalities to its users.

The impact that Open Data has on the Cypriot economy and Public Administration remains limited though. According to the "Open Data Maturity in Europe 2017"<sup>13</sup>, Open Data has moderately contributed to increasing Public Administration's efficiency. A positive step towards improving this situation has been the design of the online platform "Diavlos".

<sup>12</sup> <https://www.europeandataportal.eu/en/dashboard>

<sup>13</sup> <https://www.europeandataportal.eu/el/highlights/open-data-maturity-europe-2017>

#### Cyprus - The online service CyLaw and the online platform Diavlos

The Pan Cyprian Bar Association offers free and non-profit access to Cypriot and international sources of law through the online service CyLaw. It utilizes government Open Data (Legislation and Court Decisions) which is organized in a number of searchable online databases.

The Cypriot online platform Diavlos also provides real time information on road traffic and availability of parking places in Nicosia. This enables the collaboration and coordination between the Department of Public Works and the Local Authorities on road traffic management issues.

Source: <http://www.cylaw.org/>, <http://www.traffic4cyprus.org.cy/trafficapp/?wp=index-gr>

Similarly, the economic impact that Open Data use has on the Cypriot economy, is also identified to be low<sup>14</sup>. The significance of Open Data as an element for economic growth and innovation cannot be underestimated.

Towards this direction, a set of recommendations is put forward.

With regards to the Open Data regulatory framework, the Cypriot Public Administration shall further enhance relevant regulations. These will specify in full detail the sources of unreleased data that could be published and identify the licensing regulations for their re-use.

In addition, these regulations will exploit the use of privately-held data of public interest. Open Data policies until now were primarily focused on publicly-owned data. In practice however, a vast set of privately-held data (i.e. pharmaceutical research outcomes, vehicle-generated data to monitor the conditions of the roads, etc.) could be of high value for public interest goals (i.e. identify imminent risk to public health and security, monitor traffic, etc.).

Furthermore, a clear and actionable strategy for the enhancement of the Open Data portal shall be designed. The strategy will consist of initiatives required to enhance the portal's usability and to ensure its sustainability and value add. Namely the Open Data strategy shall cover:

- ▶ The re-design of selected portal features, so that the portal becomes more user-centric and provide an enhanced user experience
- ▶ The periodic upgrade of the portal's infrastructure
- ▶ The publishing of all datasets in machine readable formats
- ▶ The adoption of Open Data standards to ensure interoperability
- ▶ The provision of search functionality according to different criteria, i.e. file formats, etc.

<sup>14</sup> <https://www.europeandataportal.eu/el/highlights/open-data-maturity-europe-2017>

In addition, to raise awareness on the importance and value of Open Data, the Public Administration shall:

- **Increase the interaction, engagement and collaboration with the Open Data portal users and increase the uptake of data reuse:** To achieve this, the portal functionalities shall be enhanced with additional contribution mechanisms (i.e. uploading of datasets, dedicated comments sections etc.). In addition, the use of big data analytics will provide data-driven insights on the portal users, their profiles and preferences.
- **Document the economic impact of the use and deployment of Open Data:** A structured approach shall be implemented to measure the economic effect of Open Data, and regular public reporting shall be put in place.
- **Organize more relevant public events (i.e. hackathons, training sessions, conferences, etc.):** These events will raise attention on the value that Open Data can bring to society and the economy and will enable users to co-develop products and services.



## ENHANCE CYBERSECURITY & ePRIVACY

Next to open data, cybersecurity and ePrivacy shall also feature high on the list of Cyprus's priorities to strengthen citizens' trust. Trust and security are also placed at the core of the Digital Single Market Strategy. Worth noting is that the fight against cybercrime is one of the three pillars of the European Agenda on Security<sup>15</sup>.

Cyprus has thus far undertaken significant initiatives to ensure cyber resilience to digital threats. In 2013, Cyprus introduced the "Cybersecurity Strategy of the Republic of Cyprus"<sup>16</sup> that aimed to increase the global resilience and security of national ICT assets. Contingent to the EU Directive of security of network and information systems (NIS Directive), Cyprus, under the supervision of the Office of the Commissioner of Electronic Communications and Postal Regulation (OCECPR), also set up a Computer Security Incident Response Team (CSIRT)<sup>17</sup>. This team is responsible for responding to nation-wide, cybersecurity incidents across all critical infrastructures<sup>18</sup>. With regards to critical infrastructure (CI) protection, the OCECPR has developed a national risk assessment methodology based on NIST SP 800-3029 and ISO 2700530 and guidance from ENISA<sup>19</sup>.

In addition, the Cyprus Cybercrime Center of Excellence (3CE)<sup>20</sup> provides short-term, focused and specialized training seminars on cybercrime-related issues for public and private sector participants.

The Public Administration shall continue to promote, support and participate in international information security initiatives and campaigns such as the European Cybersecurity Month<sup>21</sup>, to raise awareness across the Cypriot society and economy.

Given the dynamic and fast-changing environment in the area of cybersecurity, an additional number of specific steps is suggested. These will improve Cyprus's level of cyber resilience and awareness and accelerate the country's digital rotation.

As a first step, the existing cybersecurity strategy shall be reviewed both by private and public-sector stakeholders that manage critical information infrastructure.

The newly established National CSIRT of Cyprus (Computer Security Incident Response Team) shall establish formal communication channels with the European Network and Information Security Agency, the Computer Emergency Response Team for the EU institutions (CERT-EU) and other EU member states to enhance collaboration and exchange information on good practices with regards to cyber resilience.

<sup>15</sup> <https://ec.europa.eu/digital-single-market/en/cybersecurity-privacy>

<sup>16</sup> <https://www.enisa.europa.eu/topics/national-cyber-security-strategies/ncss-map/strategies/national-cyber-security-strategy-cyprus>

<sup>17</sup> <https://csirt.cy/>

<sup>18</sup> <https://csirt.cy/>

<sup>19</sup> <https://www.enisa.europa.eu>

<sup>20</sup> <http://www.3ce.cy/en/>

<sup>21</sup> <http://www.ekathimerini.com/233529/article/ekathimerini/news/cyprus-gears-up-for-a-major-cyberattack-and-cybercrime>

As vital economic sectors become increasingly digitalized, cyber threats are expected to multiply. For the first time, private businesses such as oil and energy suppliers are visible and accessible online. Businesses across all industries shall proactively develop capabilities to detect, respond and recover from cyber-attacks. First step towards this direction, can be the incentivization of private companies to conduct risk assessment exercises for their organizations' infrastructure. This can include the provision of tax or fiscal benefits to companies for the adoption of standard security tools and processes. An alternative solution can be the introduction of a digital security innovation voucher scheme to help companies adopt cyber security practices and protect their infrastructure. In addition, the Public Administration shall join forces with the private sector and academia to develop innovative solutions tailored to the needs of businesses or targeted sectors to effectively support them tackle cybersecurity threats.

Raising awareness on cybersecurity threats and vulnerabilities is also important for the cultivation of a cybersecurity mindset across the Cypriot society and economy. This can be achieved through:

- ▶ The setup of targeted awareness programs to promote Cypriot citizens' understanding of online protection
- ▶ The development dedicated awareness-raising programs for the Cypriot industries, with special emphasis to industries managing critical information infrastructure, i.e. the financial and telecommunications sectors
- ▶ The enhancement of cooperation between the private sector and academia to develop cybersecurity educational offerings

### **Cyber security programs in Estonia**



Estonia is taking several measures to increase the number of cyber security experts in its country. The Ministry of Defence is providing grants to PhD-Students, whose thesis themes refer to topics in cyber security. In addition, cyber security programs at universities have been developed, including an IT-Law-Program at Tartu university. In order to raise awareness for information security, cyber security courses are included in all IT-related university programs. Furthermore, secondary schools have included cyber security studies in which students can major in.

Source: NCSS Good Practice Guide, <https://www.enisa.europa.eu/publications/ncss-good-practice-guide>





## ENSURE THAT THE KEY ENABLERS ARE IN PLACE

During the last years, Cyprus demonstrated significant progress with regards to the implementation of a set of key services, i.e.:

- ▶ The electronic management of official documentation, through the introduction of the Electronic Office Automation System (eOASIS). The eOASIS serves as a records management system, operates in 22 government organizations including the Cyprus Police and serves around 4000 users.
- ▶ The provision of the Single Sign On (SSO) capability for users accessing Government portals (i.e. Government Secure Gateway (Ariadne)).
- ▶ The revamping of the National Interoperability Framework (NIF) of Cyprus in August 2016 to become aligned with the European Interoperability Framework (EIF).

To further enable data privacy and cybersecurity the implementation of electronic identification (eID) is proposed. In fact, the implementation of a reliable system of electronic signatures and certifications will make electronic commerce safer and will enable the efficient electronic delivery of services to businesses and citizens.

According to interviewed Public Sector stakeholders and publicly available information<sup>22</sup>, the implementation of the eID and eSignature initiatives are currently in progress. In more detail, the Cypriot Public Administration joined forces with the eGovernment Academy of Estonia, for

the latter to provide expertise with regards to the respective policy and infrastructure design. In addition, the Cypriot Public Administration has decided to purchase the media for eID and eSignature certificates from a Communication Service Provider (CSP), instead of developing it in-house.

Building on these positive steps, efforts for the implementation of eID and eSignature initiatives need to significantly gear up. These two projects are earmarked as top priority activities, critical to the nation's digital rotation.

22. [https://joinup.ec.europa.eu/sites/default/files/document/2015-03/egov\\_in\\_cyprus\\_-\\_january\\_2015\\_-\\_v\\_17\\_0\\_final.pdf](https://joinup.ec.europa.eu/sites/default/files/document/2015-03/egov_in_cyprus_-_january_2015_-_v_17_0_final.pdf)

## THE 2<sup>ND</sup> GOAL - DRIVE MASS ADOPTION OF DIGITAL

The completion of the foundational activities will ensure that all the basics will be in place for Cyprus to focus on its key target to accelerate the transformation; that is to ensure mass adoption of digital and to unlock the nation's digital potential. However, digital adoption doesn't come in a vacuum. On the contrary, it sets as a prerequisite that the Cypriot Public Administration, supported by all relevant private and academic stakeholders, shall undertake targeted efforts towards to two different directions:

- ▶ Invest to increase digital literacy and awareness, in order to unlock the human capital and "fuel" the country's rotation to digital
- ▶ Provide transparent, simpler, faster and more user-centric digital services to increase citizens' and businesses' engagement, trust and motivation in the digital technologies

## UNLOCK THE HUMAN CAPITAL

The pervasiveness of digital disrupts the labor market redefines the very concept of work and gives birth to new sets of skills required. According to WEF, it is estimated that 65 percent of children entering primary school today will be active in jobs that currently do not exist<sup>23</sup>.

At the same time, digital leads to an increased demand for more skilled ICT professionals in all sectors of the global economy. According to EU analysis, it is estimated that there will be 500,000 unfilled vacancies for ICT professionals by 2020<sup>24</sup>. In the meantime, the skills gap is becoming an ever-widening chasm. Already today, 40 percent of employers worldwide report talent shortages<sup>25</sup>. With dramatic shifts in expected skills requirements, the gap is likely to increase. In fact, by 2020, more than one-third of the desired skill sets will be comprised of skills not yet considered crucial today<sup>26</sup>.

Cyprus's unfavorable position with regards to the digital skills is noteworthy. Consider:

- ▶ The low percentage (50 percent) of its population possessing basic digital capabilities<sup>27</sup>
- ▶ The significantly low share of STEM graduates (9,8 per 1000 individuals)<sup>28</sup>
- ▶ The fact that the top 3 growing occupations/ professions in Cyprus in 2016 were the secretaries, the security services workers and the transport clerks - occupations highly prone to become automated through digital<sup>29</sup>
- ▶ The low usage of digital channels for everyday tasks, i.e. online banking and shopping (34 percent and 39 percent respectively)

23. WEF, *The Future of Jobs*, [http://www3.weforum.org/docs/WEF\\_FOJ\\_Executive\\_Summary\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_FOJ_Executive_Summary_Jobs.pdf)

24. <https://ec.europa.eu/digital-single-market/en/policies/digital-skills>

25. ManpowerGroup: 2016/2017 Talent Shortage Survey

26. WEF, *The Future of Jobs*, [http://www3.weforum.org/docs/WEF\\_FOJ\\_Executive\\_Summary\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_FOJ_Executive_Summary_Jobs.pdf)

27. <https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus>

28. *ibid*

29. <http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets>

The case for Cyprus is clear: Leaders across the Cypriot public and private sectors need to build the future workforce. This will require leaders to ask tough questions. How do we: Develop the new talent? Scale and accelerate the pace of change? Make sure the people now don't get left behind? Secure the right amount and type of investment in people to prepare them? Leaders must proactively work to address the complex equation they are facing. Towards this goal, no one shall be left out. Both private and public sectors, as well as academia, shall all contribute.

There are three key actions to be taken:

- **Accelerate reskilling people** - Equip all citizens with basic ICT skills and knowledge to improve their quality of life and increase awareness on the opportunities and threats of the information society
- **Strengthen the talent pipeline from its source** - Transform the learning of digital skills, develop advanced ICT skills via higher education and stimulate STEM (Science, Technology, Engineering, Mathematics) education
- **"New-skill" the workforce** - Digitally upskill and reskill Public and Private Sector workforce to equip them with new digital skills required



## ACCELERATE RESKILLING PEOPLE

Citizens need digital skills for an increasing number of their activities. Currently, a set of initiatives is in place (i.e. population-wide training workshops on e-Skills and eGovernment organized by the Cyprus Productivity Center and the Department of Electronic Communications<sup>30</sup>) and contributes towards the digital upskilling of the Cypriot society. Public Administration, supported by the private sector, industry federations and academia must intensify their efforts to increase the Cypriot society's basic digital skills and strengthen their confidence in digital. To achieve this a set of additional activities is proposed:

- **Use digital to learn digital:** Not only are digital technologies good teachers, but there are a wide range of digital tools that can be paired with citizens' learning styles, circumstances and environments. The launching of new e-learning and open online courses (i.e. MOOCs) on ICT topics and new technologies, designed by ICT educational institutions and ICT industry stakeholders, will enable real-time learning at the point of need. These online courses can also provide accreditation to the citizens upon their completion of the online course. The e-Gnosis web platform provided by the Cyprus Productivity Centre is a successful example towards this direction<sup>31</sup>.
- **Provide incentivization to improve digital literacy:** Financial incentivization is a key enabler towards improving digital literacy. Vouchers provided to disadvantaged groups (i.e. less educated, elderly, low income, unemployed etc.) can further encourage them to use the internet more frequently and participate in digital skills training programs. In addition, the provision of financial incentives to public institutions (i.e. schools, libraries, etc.) can enable them to use their facilities, while not occupied, for the provision of digital skills training seminars and courses.
- **Foster digital literacy programs:** Building upon the launched awareness campaigns in 2017<sup>32</sup>, Public Administration entities shall further accelerate their efforts to carry out targeted nation-wide, awareness-raising initiatives and advertise the benefits of using digital technologies. At a community level, local authorities, supported by NGOs and volunteers, can also organize regional community initiatives for the acquisition of basic ICT skills.

### Belgium - Digital Skills Fund

The Digital Skills BDSF Fund (Belgium) is a recent initiative by the Belgian Government to subsidize training in information technology for disadvantaged groups. The BDSF targets young people and members of risk groups on radicalization. By training them on digital skills, it increases their chances of employment and thus their economic independence. The BDSF currently runs over a period of four years and has a budget of 24.0 million EUR in total. The Federal Public information and communication technology will be assisted by an experienced partner from the private sector for the detection of projects and initiatives that can qualify for funding under the BDSF.

Source: <https://ec.europa.eu/digital-single-market/en/content/belgium-digital-skills-fund>

<sup>30</sup> <http://www.kepa.gov.cy/Mathisi/BusinessDirectory/Company/CompanyHome.aspx?CompanyId=2cd62e90-7afa-4b02-8981-e2640be13001>

<sup>31</sup> <http://www.e-gnosis.kepa.mlsi.gov.cy/mim/login/index.php>

<sup>32</sup> [ec.europa.eu/newsroom/document.cfm?doc\\_id=44294](http://ec.europa.eu/newsroom/document.cfm?doc_id=44294)

## STRENGTHEN THE TALENT PIPELINE FROM ITS SOURCE

Changes wrought by the digital revolution are widening the talent shortage. A gap that will only worsen as advances in technology further increase existing talent mismatches. Skills mismatch has a negative impact on labor productivity. Reducing this mismatch has shown to deliver a boost in efficiency of about 10 percent<sup>33</sup>.

The dearth of skills goes beyond the STEM (science, technology, engineering and math) skills needed in the digital era. While those will increasingly continue to be critical, technical jobs at all levels require more than purely technical skills. Consider software engineers: This is a role that requires creativity, collaboration and to be business savvy. The so-called “human skills”. Accenture analysis of O\*NET data from 2011 to 2014 reveals that demand for skills has changed considerably, with an increased emphasis on uniquely human skills<sup>34</sup>.

The root cause of skills gaps reaches far back into the ecosystem to include primary and higher education. Even vocational training programs are

producing workers with inadequate skills at worst. And at best, skills that become irrelevant before reskilling can even happen. This leaves workers starting from behind and having to play catch-up.

All of this should be a concern and an opportunity for responsive and responsible leaders across the Cypriot private and public sectors and academia alike. They shall make the development of tomorrow’s talent a strategic priority for the country. To achieve this, they shall actively collaborate to identify future talent needs and to cultivate the future workforce today. Most importantly, they need to reach further back into the talent pipeline to reframe the Cypriot education system itself and shape the curricula across all levels of education to suit to the digital world.

Influencing the education curricula from the beginning and collaborating with academia to develop ICT skills and stimulate STEM education can be two ways of addressing the skills gap at its root cause.

### > Influence the education curricula from the beginning to build digital skills

Primary and secondary education shall equip all students with basic ICT skills as well as with literacy, numeracy and problem-solving capabilities. To achieve this the Ministry of Education and Culture shall actively collaborate with academia and ICT industry stakeholders, to redesign and modernize the education curricula and the teaching content. First positive steps towards this direction, have been the introduction of computer science as a subject in primary schools and the organization of the Cyprus Digital Championship<sup>35</sup>.

In addition, the design of an evaluation system to assess student’s digital capabilities across all levels of education and the provision of a personalized digital training curriculum according to individual needs can be an area of additional value. In alignment with this initiative, in 2016 the Cypriot Ministry of Commerce, Industry and Tourism, the Ministry of Education and Culture and the Ministry of Communication, Transport and Works introduced the certification of European Computer Driving License (ECDL) on a voluntary basis to secondary students in public and private schools.

33. OECD: Labor Market Mismatch and Labor Productivity Evidence from PIAAC Data, 2015

34. Accenture Research: Future of Work Economic Modeling, 2016

35. <https://web.cut.ac.cy/digitalchampion/en/>

### Cyprus - ECDL certification offered to all students in secondary education



In 2016, the Ministry of Commerce, Industry and Tourism together with the Ministry of Education and Culture and the Ministry of Communication, Transport and Works introduced the certification of European Computer Driving License (ECDL) to secondary students in public and private schools. This training is also provided to a number of soldiers and unemployed people (600 per year). Relevant training programs are also provided to people with disabilities. The objective is to have 70 percent participation out of the 7000 students studying in secondary education. The decision to finance this certification was taken by the Council of Ministers in August 2016 and the main objective is to create a digital culture in Cyprus. It is worth mentioning that this is the first time that public schools will provide vocational ICT certification. This is considered to be a breakthrough for the Cypriot education system. The implementation of the program started in January 2017 and will run for 3 years, with a budget of nearly €1 million.

Source: Europe’s Digital Progress Report (EDPR) 2017, Country Profile Cyprus

The successful delivery of the modernized educational curricula sets as an absolute prerequisite the continuous reskilling and upskilling of teachers and trainers alike. Their continuous professional development shall intensify through the provision of online courses, i.e. MOOCs and shall become incentivized. The introduction of a digital skill accreditation scheme for teachers, in cooperation with respective certification authorities, can also become a vital step towards this direction. Finally, Public Administration and the private sector need to facilitate career mobility from the ICT industry into the teaching profession to ensure the further infusion of digital skills into the education system.

### Croatia - Digital competencies for teachers (MOOC) - Erasmus+ project



Agency for Vocational Education and Training and Adult Education has coordinated the DIGICOMP project from September 1<sup>st</sup> 2014 to August 31<sup>st</sup> 2016. The project was based on the respective EU framework for developing digital competencies. The goal of the DIGICOMP project was to create an online training portal (OER), which would allow teachers to learn about digital competences, described in DIGICOMP framework, in an online seminar. Participants should prepare coursework at the end of the online seminar, get coursework approved by peer-assessment with the implemented methodology from the European guidelines for the validation of non-formal and informal learning and synchronize their achievement documents with their Europass portfolio.

Source: <https://ec.europa.eu/digital-single-market/en/content/digital-competencies-teachers-mooc-erasmus-project>

► **Collaborate with academia to develop ICT professionals and stimulate STEM education**

There should be no doubt on the necessity for Cyprus to become equipped with more ICT professionals. For them, basic programming is no longer enough. Advanced engineering and experience with machine learning, big data analytics and network management gain significant importance. For this to happen, the academic agenda needs to be updated - not just in engineering programs. This also includes higher education, community colleges as well as nondegree programs.

The online dialogue amongst academia, policy makers and the private sector must be strengthened. Closer collaboration needs to be forged to define ICT skill requirements, develop recommendations for the academic institutions and plug the gap in advanced ICT skills. The National Coalition for Digital Skills and Jobs, Grow Digital - CY, is a good example. This interplay between several ministries breaks down silos and makes collaboration happen, not only at governmental level but also across industry and education<sup>36</sup>.

To stimulate, enhance and extend the STEM skillset, the provision of different sets of financial and non-financial incentives is required. Each incentive is suggested to layout different types of intervention.

As a first, Public Administration supported by the private sector shall begin to provide financial incentives for students to study STEM sciences at tertiary level. For instance, the provision of income-contingent student loans with reduced compulsory repayments for students studying STEM practices, or the provision of STEM scholarships and grants to underrepresented groups in STEM occupations could increase the enrolment in these disciplines.

Public Administration shall also further support the doctoral and postdoctoral STEM education. This can act as the basis of science - driven innovation through the introduction of relevant programs. The provision of scientific research skills through doctoral and postdoctoral training shall also become an important element of the updated education policy.

Finally, companies and Public Administration alike, shall seize the opportunity to increase their intake of STEM graduates. Such a development can be initiated via the setup of a relevant mechanism, already evident in other countries around the world (i.e. paid internships for top STEM graduates within the Public Administration or in private organizations, etc.).



**Cyprus - National coalition for digital skills and jobs - Grow Digital CY**

In 2015, Cyprus launched a national coalition for digital skills and jobs in support of the European Commission's call for action within the Grand Coalition. This initiative was undertaken by Cyprus's Digital Champion with the cooperation of the Department of Electronic Communications. The National Coalition is a partnership with public institutions, professional communities, private companies and non-profit organizations. There is a three-year action plan aiming to promote the diffusion and the improvement of digital skills in order to address the anticipated future mismatch between ICT professionals and work force vacancies. Stakeholders have proposed actions aiming to ensure the adequate and continuous supply of high quality graduates according to the labor market needs. Proposed actions were divided into two implementation phases, short term and long-term actions and sorted under the following categories; 1) Education and Training, 2) Certification and 3) Awareness.

Source: <https://ec.europa.eu/digital-single-market/en/news/cyprus-launches-national-coalition-digital-skills-and-jobs>



**Netherlands - Human Capital Agenda IT**

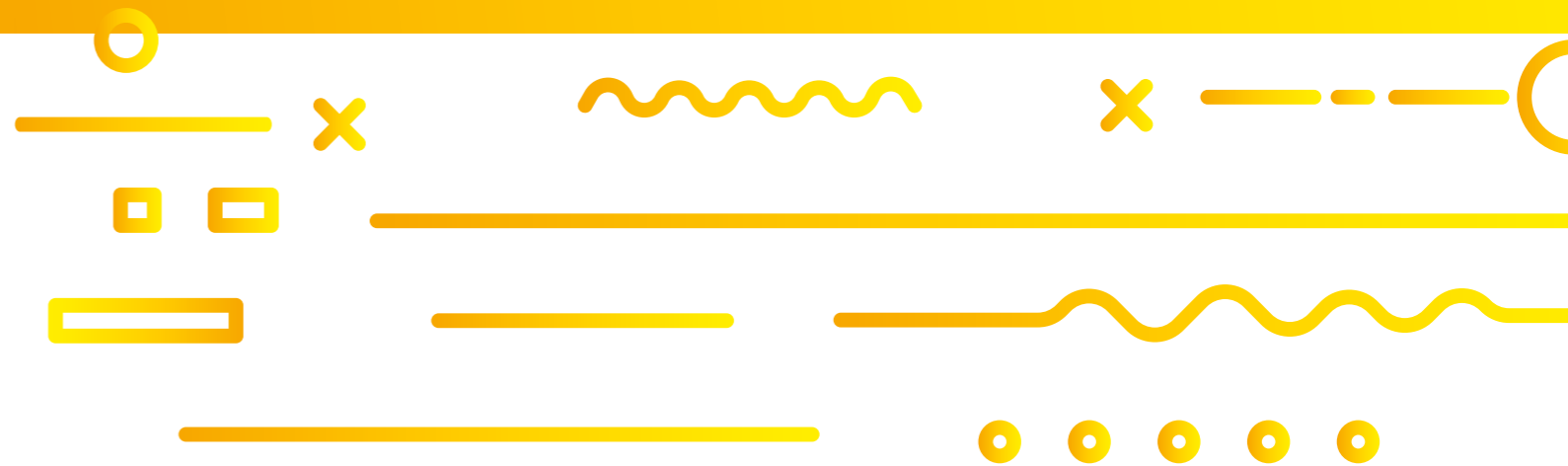
The Human Capital Agenda IT is one of the action programs that Team ICT initiated. Team ICT was launched by the minister of Economic Affairs in 2014 to advance IT innovation and it initiated joint action of government, business and education. For the human capital agenda, the Ministry of Economic Affairs spends approximately €300.000 annually. Businesses, industry associations and regional partners also contribute to the program.

HCA IT focalizes on increasing the amount of ICT and STEM students, increasing the participation of companies in education and promoting lifelong learning. Actions include promoting STEM studies, providing scholarships for excellent STEM students and decreasing the deficit on STEM and ICT teachers. The program targets ICT professionals and aims to decrease the deficit on ICT skills. The main focus is on big data experts, security specialists and business analysts.

Source: <https://ec.europa.eu/digital-single-market/en/content/human-capital-agenda-it>

In the same context, the ICT sector shall team up with academia to encourage work-based learning (i.e. paid traineeships, funded apprenticeships, etc.) as an integral part of the ICT education. This initiative can be further supported via Public Administration's incentivization (i.e. tax incentives, training vouchers, etc.) to ICT organizations.

36. <http://www.digitaljobs.cyprus-digitalchampion.gov.cy/el/page/home>



## “NEW-SKILL” THE WORKFORCE

According to Accenture research, while business leaders signal the importance of talent for the success of their organization’s digital transformation, only 51 percent of those admit that they already have a strategy for attracting and onboarding talent<sup>37</sup>.

### > Enable digital upskilling through ecosystems and platforms

Organizations shall create physical and virtual networks, deliver valuable digital skills training, generate feedback and create access to potential new roles and projects. This shall allow companies and public-sector entities to rapidly upskill their workforce as well as to tap into new sources of talent.

To further support this, the Public Administration, in collaboration with the Human Resource Development Authority of Cyprus<sup>38</sup>, shall provide targeted financial incentives to companies to commit employers to upskilling their workforce and to implement lifelong learning policies. Moreover, selected training programs could be made mandatory and become accompanied by the appropriate certifications that will comply with the European professional accreditation schemes. Finally, an open, e-Learning platform that will provide snack-sized training programs on digital skills, tailor-made for different industries and sizes of enterprises could also be designed and introduced.

### > Reskill at the top of the house

Preparing the workforce for digital doesn’t exclude the higher echelons of the organizations. Accenture research shows a general shortage of technology experience in boardrooms: Only 10 percent of board members surveyed report having professional technology experience<sup>39</sup>. Today’s leaders need to understand both business fundamentals and the power of new technologies. They also need to be “digital architects,” equipped with a new set of attributes that enables them to succeed in a disruptive environment. To achieve this, they need new leadership skills. Specifically: the ability to manage in horizontal not hierarchal ways; the ability to demonstrate intellectual curiosity; and the ability to go beyond “measurement and management” to inspire creativity and new ways of thinking.

### > Create a more flexible workforce model

Rigid, formal job structures do not support the speed and agility needed in the face of digital innovation. In fact, the new workforce needs to become a flexible, adaptive pool of talent. To achieve this, organizations shall redefine and co-create employment opportunities through more responsive role-based and gig-like work. These opportunities need to be made available to both full-time employees that sit within an organization, as well as to outsiders brought in at speed and on an as-needed basis.

### > Tap into boomers for a knowledge boost

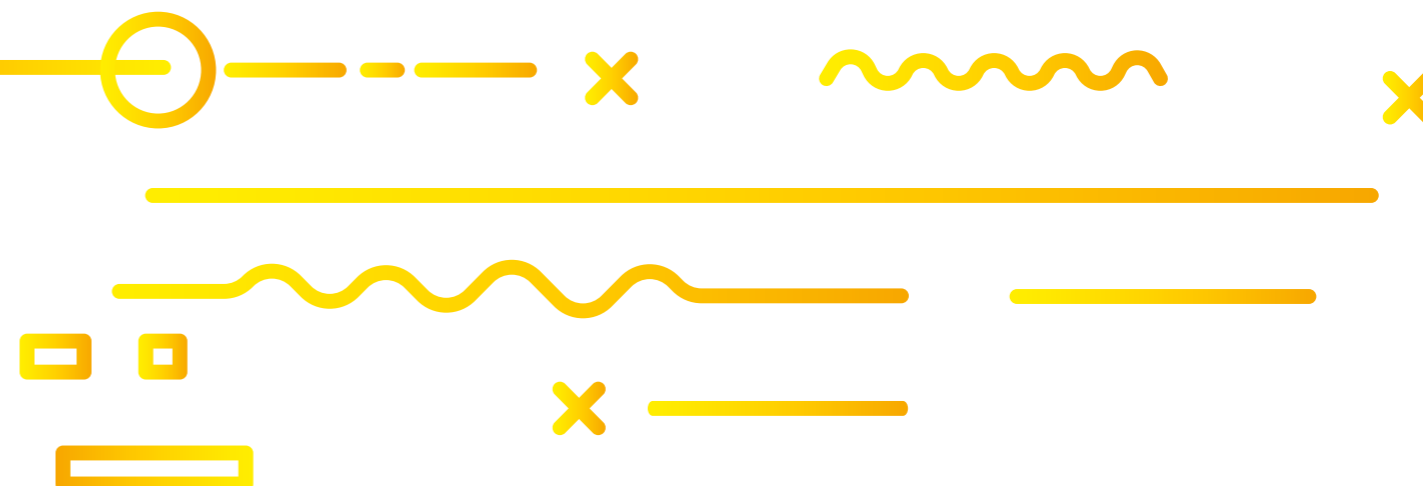
Finally, organizations need to preserve the knowledge held by their more seasoned workforce. A stark reminder of our aging population, people aged 65 and older will outnumber children under the age of five for the first time in history by 2020<sup>40</sup>. Companies need to safeguard the knowledge of these “wisdom workers”, while rapidly on-boarding their newer talent pools. For this to successfully happen, organizations shall tap current “wisdom workers” and recently retired executives to coach new talent. In fact, this is an increasingly popular tactic. According to the Society for Human Resource Management, eight percent of 463 companies surveyed have deployed such programs<sup>41</sup>.



### Italy - Crescere in Digitale

“Crescere in Digitale” is an Italian-based initiative implemented by the Ministry of Labor and Social Policies, in partnership with the Italian Chambers of Commerce and Google, financed by the National Operational Program Youth Employment Initiative. The project offers training and traineeships for young people in order to support businesses in the digital economy. The program offers 50-hours of free online training provided to all Italian young people not in education, employment, or training who are registered to the Youth Guarantee Program, managed by the Managing Authority of the Ministry of Labor.

Source: <http://www.crescereindigitale.it/>



37. [https://www.accenture.com/t20161219T223536\\_w\\_us-en/acnmedia/PDF-4/Accenture-Strategy-Digital-Workforce-Future-of-Work.pdf](https://www.accenture.com/t20161219T223536_w_us-en/acnmedia/PDF-4/Accenture-Strategy-Digital-Workforce-Future-of-Work.pdf)  
38. <http://www.hrdauth.org.cy/>

39. Accenture: Tech Experience: Women’s Stepping Stone to the Corporate Boardroom?, 2016  
40. US Census Bureau: An Aging World, 2015  
41. <http://www.nytimes.com/2016/12/16/business/retirement/boomerang-boom-more-firms-tapping-the-skills-of-the-recently-retired.html> (last accessed December 22, 2016)

## THE DIGITALIZATION OF THE PUBLIC ADMINISTRATION

As discussed in Chapter 1, digital citizens expect their Public Administrations to provide dramatic changes in the way they operate and to offer high quality digital services. These new, “liquid” citizen expectations center around the themes of public trust and accountability, productivity, openness, innovation and co-creation. In fact, a digital citizen survey by Accenture<sup>42</sup> showed that more than 60 percent of citizens expect public service organizations to use innovative technologies and digital solutions to improve service delivery. Worth mentioning is that only 40 percent of the global sample declare that they are satisfied with the service experience they have when dealing with public agencies.

With regards to Digital Public Services, Cyprus has performed significant efforts to provide a wide range of digital services both to businesses and citizens through the introduction of the

Government Secure Gateway (Ariadne) that currently provides more than 65 eServices<sup>43</sup>. Nevertheless, progress is below EU average, with 49 percent of internet users using digital public services in 2017<sup>44</sup>. As the eGovernment Benchmark Insight Report<sup>45</sup> indicates, there is indeed significant room for improvement with regards to the user centricity of the provided digital services.

It is vital that the Cypriot Public Administration transforms from a passive fulfilment service provider to an active, user-centric value creator. This new operating model requires agility, speed, and flexibility. To address these needs, the Cypriot Public Administration shall digitalize internally and recalibrate existing organizational structures, systems, resources and culture. It shall act imminently with a “laser focus” on user-centricity and execution.

## REDESIGN END-TO-END PUBLIC SERVICES

At the heart of Public Administration’s digital transformation, we place the redesign of selected end-to-end public services.

Contrary to commercial organizations, Public Administrations worldwide are required to deliver a wide range of services to meet the needs of a much broader audience. These services cover the entire lifecycle of citizens and businesses and range to include healthcare, and education to law enforcement and business operations. They need to span across the online and offline worlds and to support productive engagement across a variety of scenarios.

For this reason, the Public Administration shall firstly prioritize the services that matter most to citizens and businesses. According to interviews, the Unit of Administrative Reform has already begun the evaluation and redesign of selected public services. This initiative shall be further accelerated and extend to cover all relevant services.

Based on the nature of each specific service, digital can transform this in different ways. We have grouped our suggested interventions into four distinct categories, defined by the level of digital influence (see the table below).



**Digitally supported Public Services**



**Digitally enabled Public Services**



**Digitally-driven Public Services**



**Artificial Intelligence-led Public Services**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Description</b>	Humans provide public services, but support processes are digitalized. Typically, such public services rely heavily on physical work or involve tangible assets	The potential for digitalization for these services is huge, but digital technologies can play only an enabling role. Humans are solely responsible for all value-and judgement-based decisions	The Public Services can be completely digitalized and often run as “background tasks”. They are fully electronic and normally do not produce any physical deliverables	Artificial Intelligence (AI) will analyze available data to deliver insights and intervene to get the most productive outcome
<b>Workforce</b>	Provides the service	Makes value-and judgment-based decisions	Intervenes only if necessary	Designs the framework conditions for the AI-led services
<b>Technology</b>	Supports the service	Enables the service	Generates and provides the service	Makes decisions and acts upon them
<b>Example</b>	Law Enforcement and public security, justice, defence, emergency services, social housing and waste collection	Healthcare and medicine, education and town planning, electronic property and information mapping services	Payment of social security and pension benefits, taxation, administrative services, e.g. obtaining a license or a permit	Early warning systems, identification of known and unknown threats, swift diagnosis and so forth

Source: European Digital Forum: Government of the Future - How Digital Technology Will Change the Way We Live, Work & Govern, <http://www.lisboncouncil.net/publication/publication/130-government-of-the-future-.html>

Figure 3.2. Process categorization according to level of digital influence



42. Accenture Public Service Global Citizen Survey 2017, [https://www.accenture.com/t00010101T0000007\\_w\\_/gb-en/\\_acnmedia/PDF-69/Accenture-Public-Service-Citizen-Survey-Wave3-UK.pdf](https://www.accenture.com/t00010101T0000007_w_/gb-en/_acnmedia/PDF-69/Accenture-Public-Service-Citizen-Survey-Wave3-UK.pdf)

43. *ibid*

44. [http://ec.europa.eu/information\\_society/newsroom/image/document/2018-20/cy-desi\\_2018-country-profile\\_eng\\_B43F6E93-DC41-A4D3-6FFDC85F4EC8246B\\_52217.pdf](http://ec.europa.eu/information_society/newsroom/image/document/2018-20/cy-desi_2018-country-profile_eng_B43F6E93-DC41-A4D3-6FFDC85F4EC8246B_52217.pdf)

45. [https://www.capgemini.com/wp-content/uploads/2017/11/2017-egovernment-benchmark\\_background\\_v7.pdf](https://www.capgemini.com/wp-content/uploads/2017/11/2017-egovernment-benchmark_background_v7.pdf)

Regardless of the level of “digital influence”, the redesigned services shall demonstrate higher levels of personalization. A “mobile first” strategy shall also be adopted to support the design of mobile-friendly, public-sector websites and make services and information easily-accessible through portable devices.

According to the “Future-proofing eGovernment for a Digital Single Market” report, Public Administrations across Europe are yet to improve the mobile experience that they provide to their citizens, with only 1 in 4 public sector websites currently being mobile-friendly<sup>46</sup>. Cyprus has scored 29<sup>th</sup> amongst 33 European countries with regards to the provision of mobile friendly public websites<sup>47</sup>.

Leading case with regards to the design and provision of open and insight-driven public services is Norway and Altinn. The online portal for the provision of digital eGovernment services.

## SIMPLIFY AND RE-ENGINEER INTERNAL PROCESSES USING AN “OUTSIDE IN” APPROACH

The transition towards user-centric digital services triggers a wider transformation, rather than simply moving an existing service onto the Internet (e.g. booking appointments with civil servants online). For this reason, these new, user-centric, digital services set as a prerequisite the transformation of their processual backbone; namely, their supporting and often outdated processes. Processes shall transform from conventional

procedures that create a new electronic bureaucracy to integrated and lean processes that drive efficiencies, reduce costs and provide high quality to citizens, businesses and the internal workforce.

The process simplification shall adopt an “outside in” approach, situating citizen input at the heart of the new process.



46. <https://ec.europa.eu/futurium/en/content/future-proofing-egovernment-digital-single-market>

47. [http://www.mof.gov.cy/mof/DITS/dits.nsf/All/20972F43AEA760FBC2257F5D003502D4/\\$file/eGovernmentBenchmarkBackgroundReport.pdf](http://www.mof.gov.cy/mof/DITS/dits.nsf/All/20972F43AEA760FBC2257F5D003502D4/$file/eGovernmentBenchmarkBackgroundReport.pdf)

## FOSTER AN AGILE DELIVERY MODEL, A MULTI-SPEED IT INFRASTRUCTURE AND A NEW SOURCING MECHANISM

### > The Delivery Model

Massive waterfall implementations have been commonplace across Public Administration entities and IT vendors that support them. The implementation of a new system used to be an IT priority and business stakeholders were only involved at the very start and the very end of the IT project.

Public Administration shall alter this delivery model and embrace an iterative, agile approach for the development of new services that will be implemented in shorter timeframes and will offer end-users greater, and earlier input into the process. The new systems shall no longer be an IT priority. Instead, they should become an organizational priority. This new, agile approach will trigger the introduction of new cooperative models for the design of the end-to-end digital services that will facilitate the interaction of all required stakeholders. The adoption of this agile approach will also enable leaders to recognize that system requirements can and should change to address the often rapidly evolving needs. Leaders shall become willing to take risks, try new approaches and “fail fast” - using what’s learned to produce better long-term results.

### > The IT Infrastructure

On-premise solutions-with hardware, software and applications owned and maintained by Public Administration IT staff-was the standard for decades. Today there’s no longer a need for the Cypriot Public Administration to purchase and control all components that power its IT infrastructure. Instead, they shall push toward the implementation of digital, cloud and as-a-Service solutions, assets and offerings- which support greater flexibility, scalability and cost efficiency.

To avoid the creation of a “spaghetti architecture”, a set of common standards and a common frame for the management of IT architecture is required. In addition, the design and implementation of a multi- speed IT infrastructure is suggested. This will enable Public Administration to manage the large, complex legacy operational systems that are slow to change but maintain the rhythm of business operations, while at the same time support the nimble, agile “new IT” that supports digital services and operations.

### > The New Sourcing Mechanism

Within the last years, Cyprus has performed a first bold move and reshaped its sourcing and partnering mechanism, through the introduction of a centralized procurement portal that significantly reduces costs and accelerates the procure-to-pay process.

### eProcurement System of the Public Procurement Directorate of the Treasury of the Republic of Cyprus



The eProcurement System<sup>7</sup> (ePs) is a secure and interoperable web-based application of the Republic of Cyprus (utilizing Open Source Software), which constitutes a comprehensive solution for the implementation of electronic procedures in conducting public procurement competitions. Since November 2009 ePs is fully functional and serves all Contracting Authorities in Cyprus for free, for all types of Procedures and all types of public procurement competitions. The system complies with the provisions of the European and Cypriot Law of public procurement. In September 2011, the Treasury of the Republic was awarded the Innovation Award of 2010, for the wider public sector, thanks to the development and implementation of the eProcurement System. Furthermore, ePs placed Cyprus first in the area of eProcurement amongst the Member States of the EU. Finally, it was awarded the Good Practice Label in the framework of the 4th European eGovernment Awards of 2009. The ePS in Cyprus is decentralized and the Contracting Authorities include the Central Government (Ministries, Independent authorities), Municipalities and Local Authorities, Bodies Governed by Public Law, and the Utilities Sector. There are around 6000 Registered Economic Operators on the Platform and 1000 foreign Economic Operators. Every year about 4000 competitions are launched. Moreover, the value of the procurement exceeds €1 Billion and the value of online purchasing by the public sector is approximately €20 Million.

Source: <https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework>

Following this trajectory, sourcing strategies are required to move away from the traditional procurement processes. “Waterfall” approaches are long and complex and exhaustive RFPs shall be replaced. “Pharaonic”, detailed designs and budgets often become obsolete or irrelevant by the time the actual project is about to be implemented.

The new sourcing policies shall provide the missing flexibility to support agile software development. Sourcing strategies will be required to act as an enabler of the ICT industry and to be used as a tool that stimulates demand and strengthen big and small companies alike.

The City of London has already moved towards this direction through the introduction of a transformation procurement and purchase-to-pay program.





### United Kingdom - The City of London Procurement and Purchase-to-Pay Program

In 2011, the City of London decided to take a transformative approach to procurement by designing a digital marketplace and collaborating across an ecosystem of partners and suppliers. Prior to the introduction of the new system, the Council used an outdated service which favored established businesses and was inefficient on resource-spend. SMEs found it extremely hard to compete because the City Council did not have the capacity to analyze the myriad of individual offerings. The new system however has centralized the procurement of 18 departments and has made the City one of the best local authorities to do business with, especially for SMEs.

The project has led to the creation of multiple e-Procurement tools: e-marketplace; e-invoicing; and an online 'city buyer' portal. This has opened up a procurement ecosystem, which has encouraged projects and proposals from the private sector to submit innovative solutions. Selection is based on meritocracy and efficiency, rather than prior work or company size. The unified platforms have helped the City to exploit the latest procurement techniques, such as category and demand management as well as negotiate better with suppliers. They are also wholly-inclusive, across departments, which has allowed SMEs to provide solutions for the Borough as a whole, rather than segmenting services based on departmental divisions.

Overall the new system allows private service providers to compete on a level platform from which the Council can reliably select the best candidate. The change in attitude, to digitalize procurement methods, has allowed the City to make substantial savings - by mid-2014, the Borough had already achieved £21.8 million in savings and was commended at the Public Procurement Awards.

Source: City of London Corporation shortlisted for LGC Awards 2014, News release, <http://www.cityoflondon.gov.uk/about-the-city/what-we-do/media-centre/news-releases/2014/Pages/city-oflondon-corporation-shortlisted-for-lgc-awards.aspx>

## THE "SPILLOVER BENEFITS" OF THE TWO STRATEGIC OBJECTIVES

The positive outcomes that stem out from the implementation of the two strategic goals, "Graduate" from setting the foundations and "Drive" mass adoption of digital, is only part of the digital story. Experience suggests that next to the manifested benefits also lies a set of incipient ones, best described as the "spillover benefits". These are evident on multiple instances.

To start with, the incentives and financial support provided by the Public Administration to businesses to upgrade their infrastructure shall support and facilitate companies' rapid adoption of new digital technologies. This in turn, will yield significant financial and non-financial benefits for them. The implementation of new digital tools is expected to modify companies' production and sales processes, leading to increased cost efficiencies across these areas. At the same time, the deployment of a digital IT architecture will also enforce businesses to increase their awareness on cybersecurity and adopt relevant practices that enhance the security of their internal systems. Companies will now be able to change the way they interact and communicate with their customers via digital channels. The digitalization of organizations will also set as a prerequisite the setup of a digitally savvy workforce. To

achieve this, companies will focus their efforts on attracting new, digital talent while at the same time they will train their existing personnel. Work will now become agile, innovative and highly collaborative, bringing together professionals from different departments and abolishing organizational silos.

The new, redesigned, user-centric public services (i.e. start a new business, online submission of financial reports, etc.) are also expected to digitally impact organizations. "Digital by default" public services will enforce compliance across the Cypriot companies and will infuse transparency both across businesses' and within Public Administration's services. In addition, the enforcement of digital public services will inevitably increase businesses' level of digitalization. In fact, the adherence and use of digital public services will necessitate the redesign and automation of organizations' internal operations and the adoption of new digital tools to achieve seamless communication with the Cypriot Public Administration. The new automated internal processes are also expected to reduce the workload of repetitive, low value tasks and achieve important time/ cost efficiencies.

# THE 3<sup>RD</sup> GOAL - "ARCHITECT" NEW RELATIONSHIPS

## THE DEFINING ROLE OF DIGITAL PLATFORMS FOR THE GLOBAL DIGITAL ECONOMY

Social networks like Facebook and Twitter, search engines like Google, messaging and communication applications like WhatsApp and Skype, and ride-sharing and accommodation companies like Uber and Airbnb dominate the headlines. Despite their many differences, these companies have much in common. They are platform-based companies that have disrupted long-established sectors, taking incumbents by surprise. These companies are reshaping the global economy and fuel the next wave of breakthrough innovation and disruptive growth.

At the same time, traditional global brands are embracing digital platforms to capture new growth opportunities and provide increasingly innovative services and better outcomes to their customers<sup>48</sup> (see Figure 3.3).

These platform-based companies are becoming the central hubs for rich and complex digital ecosystems and act as intermediaries to connect supply with demand and create value by facilitating exchanges between interdependent groups.

However, is this emerging platform-based business model just a private sector phenomenon? The answer is no. Data indicates that platform models at a national level are also emerging. According to Accenture research, 89 percent of Public Administration executives already believe that it is important to adopt platform-based business models, and 91 percent of them think that engaging in digital partner ecosystems is critical<sup>49</sup>. Similarly, 48 percent of Public Administration executives worldwide are planning to pursue digital initiatives with new partners over the next two years<sup>50</sup>. At the same time, 12 out of 18 top performing countries with regards to their digital transformation are developing platforms as part of their national digital strategy, with the United Kingdom, Estonia and the United Arab Emirates being just three of them<sup>51</sup>.

economic and social outcomes. By investing in the core infrastructure, providing data and analytics, and managing incentives, these self-sustaining platforms are deployed jointly by nation's public and private stakeholders to drive productivity and efficiency and to accelerate innovation and economic growth for their nations or cities.

Key frontrunners in the adoption and development of national digital platforms come in all shapes and sizes. The United Kingdom has deployed the Government-as-a-Platform concept for the provision of user-centric, digital public services. Estonia with its X-Road Platform. Malaysia developed a national IoT platform and Singapore that has built a national digital platform that aims to contribute towards the digitalization of key sectors. At the same time a number of countries are developing smart city digital platforms. Barcelona, Spain, developed a smart city platform based upon which the city aims to implement more than 120 projects, while Sweden develops smart city initiatives launched across Gothenburg, Malmo and Stockholm.

National digital platforms appear to be different from industry-specific. Typically, national digital platforms are multi-sided and uniquely positioned to connect all nation's key stakeholders, namely the Public Administration, businesses, citizens and civil society and improve the country's overall

National digital platforms are found to significantly vary amongst them. The strategic objectives, national priorities and overall level of digital maturity define the role these platforms fulfil. For all their differences nevertheless, it is widely recognized that they act as powerful accelerators of economic growth and social outcomes.



Figure 3.3. Growth of traditional brands and platform-based companies

48. Interbrand Best Global Brands Report, 2016

49. Accenture Technology Vision Survey 2017

50. Accenture Tech Vision Survey 2016 among Public Sector Executives


51. Accenture Analysis

## INVESTIGATING DIGITAL FRONTRUNNERS AND THEIR ADOPTION OF NATIONAL DIGITAL PLATFORMS

While some countries actively investigate the platform potential, others already invest in them to drive efficiency in public service delivery, experiment with co-creation and explore the next frontier-growth acceleration. We have identified four digital frontrunners and analyzed their adoption of national digital platforms. In more detail, our review surfaced four leading examples of national digital platforms, deployed by digitally advanced countries. Each one display a different set of characteristics.



### **Estonia - The X-Road Platform**

 X-Road is the backbone of e-Estonia, allowing the nation's various public and private sector e-Service databases to link up and function in harmony.

X-Road was introduced in 1999 and has seen significant growth in adoption and service development since then. The platform went live in 2000 and its use was enforced across a set of public and private entities. By 2003, X-road platform was used for more than 600.000 online queries, while in 2005 the platform was used for e-voting. In 2010, the platform hosted the first eHealth service (ePrescription). Today, X-Road is also implemented in Finland, Azerbaijan, Namibia and Faroe Islands. X-Road is also the first data exchange platform in the world that allows data to be automatically exchanged between countries. Since June 2017, automatic data exchange capability has been established between Estonia and Finland.

The X-Road is a secured data exchange and information transfer platform, with cataloguing functionality to enable e-services in the private and public sectors. Originally X-Road was simply used to send queries to different databases. Now it has developed into a tool that can also write to multiple databases, transmit large data sets and perform searches across several databases simultaneously.

Apart from eHealth services, the platform currently hosts eGovernment, e-file Court System and ePolicing services. At the same time, the platform provides a set of cross-sectoral services to its users (i.e. monitoring, authentication, e-service catalogue and administration services). As of 2016, the platform consolidated data from over 900 connected organizations, public registers and databases, conducts more than 500 million transactions per year and hosts 99 percent of Estonia's state services.

Estonia develops and manages the X-Road platform through partnerships with three local SMEs and publicly tenders platform maintenance and upgrades. The key players participating in this effort are: Cybernetica, Roksnet, Aktors. The X-Road is free to use for Estonian entities and end users, and is exported to international governments and entities through a license agreement with Cybernetica.

The X-Road program is led by the Estonian Informatics Center. A Management Committee including the director and department heads of the Estonian Informatics Centre, as well as senior leadership of Cybernetica and Aktor, is responsible for the strategic planning of the X-Road platform. The platform's operations are carried out by the various departments of the Estonian Informatics Centre.

Source: <https://e-estonia.com/solutions/interoperability-services/x-road/>, Accenture analysis



### Dubai - The Smart Dubai Platform

The Smart Dubai platform was initiated in 2013 together with the setup of a Higher Committee for Smart Cities. In 2014, the Dubai Smart Government department was launched for the design and implementation of a set of digital public services. Within the same year, the Smart Government department launched the platform's strategic plan, comprising 100 initiatives and designed and published its respective blueprint. In 2015, the Dubai Smart City office was set up as the PMO for the deployment of the smart Dubai platform. Finally, in 2016 the Dubai Data Law, for dissemination and exchange of data between public and private entities was enacted and Du was selected as the single strategic partner to build, own and manage the platform.

The Smart Dubai service portfolio is currently developed and prioritized according to the state's capabilities and in line with the strategic positioning of Dubai globally. According to their Dubai Plan 2021, Dubai aims to focus and provide digital services across six key dimensions (Economy, Living, Governance, Mobility, People, Environment). In addition, the platform will provide a set of cross-sectoral, centrally hosted and cloud enabled services to its users, including security, authentication, security management, payment, and location & mapping services. These cross-sectoral services are expected also to act as the enablers for the design and deployment of the digital services across the six predefined dimensions.

The platform will be built and operated by Du, with no capex investment made by the public authorities. Du will instead charge for its use on a per consumption basis. At the same time public and private partners have been given the responsibility to develop their own solutions on the platform. The platform is expected to provide approximately 1000 services and it will have the potential to accommodate 2.7m users.

The Smart Dubai effort is coordinated by the Smart Dubai Office and involves Du as a strategic partner managing the framework, and key public-sector partners who develop smart services. The Smart Dubai Office is central and sole owner of the Smart City agenda, coordinating efforts across entities to drive strategic initiatives. At the same time, the Smart Platform Management Team comprises staff and financing from the Dubai Smart Government department and Du, with Du signing a strategic partnership agreement with the Smart Dubai Office.

Source: <https://www.smartdubai.ae/index.php>, Accenture analysis



### Norway - The Altinn platform

The Altinn portal is the Norwegian authorities' joint solution for reporting and dialogue with business and industry. Altinn has not only made Norwegian business and industry more efficient, but also made an important contribution to the modernization of the public sector.

Altinn started in 2003, as a collaboration on reporting between three government agencies. Five years later, the Altinn collaboration spanned across 23 agencies and municipalities. The platform continually expands to comprise new, user-friendly services.

Altinn is a 24/7 online portal and has significantly eased the burden of public reporting for businesses, citizens and administrators. The portal started out as a bottom-up, experimental initiative with limited funds. Now nearly half a million businesses do their statutory reporting through the portal and over 700 different public forms are available.

Just three years after the introduction of online tax forms, 85 percent of businesses used Altinn to complete their tax reports, reflecting a strong user-focused design and trust and assurance features built into the system. Businesses can deal with all financial reporting through one single entry point rather than dealing with numerous agencies. The portal also gives businesses a better overview of their financial and regulatory information.

Apart from financial reporting services, the platform currently provides the full range of services for founding, running or liquidating a business, authorizations and qualifications on running a business. In addition, it provides an extensive list of services for the individual, with regards to their health, housing, law and order, taxes and fees and work.

In more detail the platform enables:

- ▶ The coordinated log-in through the use of cross-sectoral authentication solutions
- ▶ The interaction with approximately 60 professional software systems for business and industry
- ▶ The prefilling based on central registers and the agencies' own data sources
- ▶ The provision of message services for providing feedback to users about case processing, results etc.
- ▶ The provision of storage to the users, so that they safely save their submissions and messages
- ▶ The continuous development of procedures, functionality and technology
- ▶ Altinn is developed, operated and managed by the Altinn co-operation, that consists of multiple government bodies. The Brønnøysund Register Center manages the technical solution on behalf of the co-operation and decides how it should be developed.

Source: [http://kursinfo.himolde.no/in-kurs/IBE250/Altinn\\_eng.pdf](http://kursinfo.himolde.no/in-kurs/IBE250/Altinn_eng.pdf) , <https://www.altinn.no/en/>



### Singapore - The Digital Nation Platform

During the last years Singapore has made significant efforts on developing a government owned central national platform that will support better living, stronger communities, and create more opportunities for all. The national digital platform will aim to host digital services and key projects that will contribute towards the digitalization of five key sectors: transport, home & environment, business productivity, health and enabled ageing, and public-sector services.

In these areas, the platform will aim to bring together citizens and businesses to co-create impactful solutions to address the identified challenges. To enable this, the platform aims to put in place the appropriate common infrastructure, while the Government will introduce relevant policies, standards, and enablers to encourage innovation. The development of the national digital platform commenced in 2014 and it has the potential to accommodate 5.5m users.

In more detail, this Smart Nation Platform refers to an infrastructure that is built to enable greater pervasive connectivity, better situational awareness through gathering and sharing of useful data between agencies. The data which is anonymized and analyzed, and provide insights that will contribute towards forming solutions that can help improve the lives of citizens.

The development of this Smart Nation Platform is one of the five strategic smart nation projects that Singapore launched in August 2017:

- ▶ National Digital Identity framework, for citizens and businesses to transact digitally in a convenient and secure manner;
- ▶ e-Payments drive, to allow everyone to make simple, swift, seamless, and safe payments;
- ▶ Smart Nation Sensor Platform, to accelerate the deployment of sensors and other IOT (Internet of Things) devices that will make our city more liveable and secure;
- ▶ Smart Urban Mobility, to leverage data and digital technologies, including artificial intelligence and autonomous vehicles, to further enhance the public transport commute;
- ▶ Moments of Life, which bundles relevant government services, across different agencies, to the citizen at key moments of his life. This reduces the need for citizens to transact with multiple government agencies, for a more seamless and convenient experience.

Key players participating in the development of the Digital National Platform are Sentosa, Singtel, StarHub, MyRepublic. The Smart Nation initiative is coordinated by the Smart Nation and Digital Government Office in the Prime Minister's Office, supported by other government agencies.

By investing in the core infrastructure, a transactional platform that provides data analytics and tools, and an innovation infrastructure where entities can build new solutions, Singapore is empowering the ecosystem to develop new business models. A new organizing structure will operate the platform, incentivize participation and spur continuous innovation.

Source: <https://www.smartnation.sg>, Accenture analysis

## INTRODUCING THE NATIONAL DIGITAL PLATFORM

The emergence of national digital platforms and the pivotal role that these play into accelerating digitalization, invites attention to the application of the concept within the proposed plan of digital initiatives for the operationalization of Cyprus's Digital Vision. The introduction of a national digital platform is expected to boost Cyprus's digital economy, accelerate the Cypriot industries' rotation to digital and help unlock trapped value and growth for the country.

But what will be the scope of this national digital platform? And how will this differentiate from existing digital platforms and portals that focus on the provision of digital services across different areas of activity (i.e. Ariadne)?

The national digital platform will provide much more than a set of digital services. It will become the convergent platform that will provide a set of fundamental, core "building blocks" to all digital services that any private or public stakeholder will develop. For example, authentication services, a unified, single-sign-on digital ID, a secure payment gateway etc. The provision of these common,

core functionalities will enable service providers to quickly hit the ground running. It will lead to decreased duplication of efforts and costs and will infuse digital expertise to involved stakeholders. In addition, the platform will tackle a fundamental disabler underlying all digitalization efforts thus far. This is the limited data availability, the data fragmentation and dispersion and the low data quality. The platform will bridge the available national, private and public data sources and will provide a common, interoperable data repository, from which valuable and actionable insights will be drawn.

To better understand the scope of the proposed national digital platform (see Figure 3.4), it is essential to:

- ▶ identify the recipients and users of this platform
- ▶ describe its core functionalities and finally
- ▶ define what will be the required input that will "fuel" the platform's "engines"

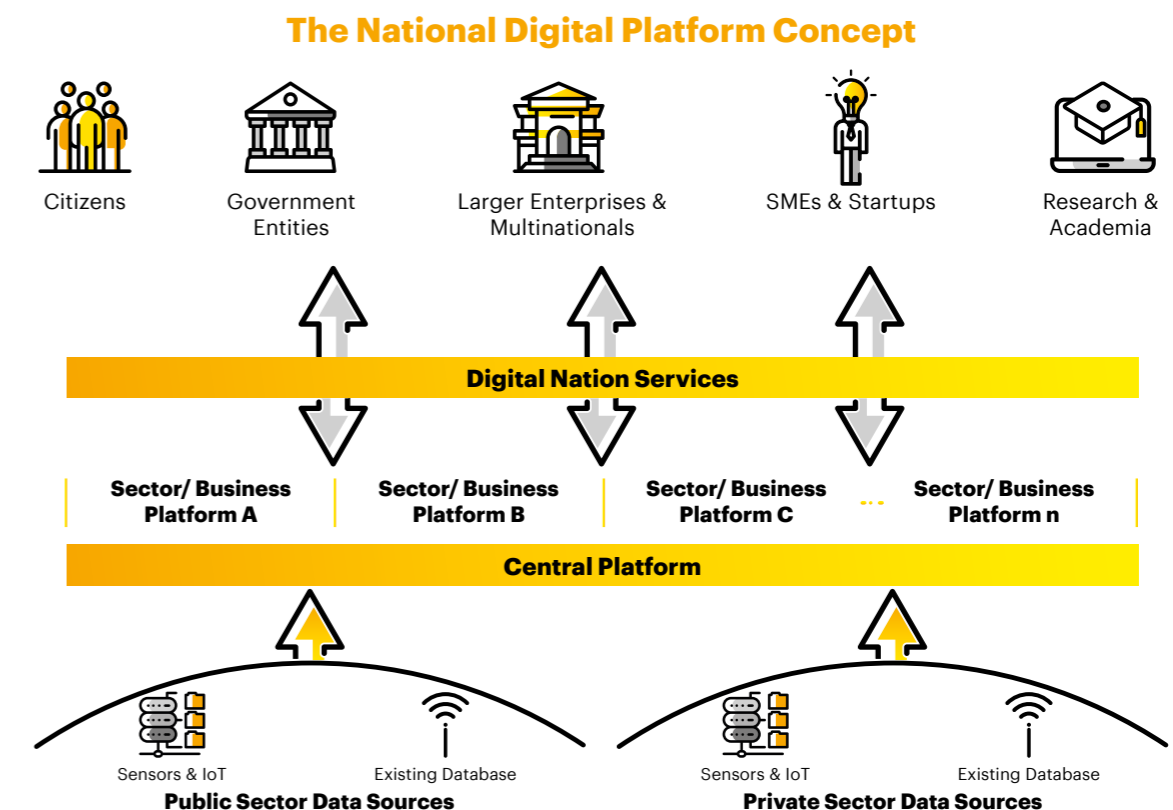


Figure 3.4. The National Digital Platform Concept

### ► **The Users of the National Digital Platform**

The National Digital Platform will provide a new way of building and reshaping digital services to meet the needs of Cyprus's national "customers"; these being citizens, businesses, academia or the Public Administration itself.

- Citizens will access new digital services through user-centric applications to improve their everyday life. For instance, households will be enabled to actively monitor and manage their energy consumption, conserve resources and save money. Tourists are likely to benefit via the provision of an integrated transportation and traffic congestion application that will allow them to better utilize the live public transportation data and make the most out of their time spent in the city.
- Entrepreneurs and business owners will be enabled to simplify and digitalize their everyday business activities; from starting a new business to streamlining their financial and statutory reporting. The introduction of e-invoicing and a reliable digital payment gateway, will also significantly increase the efficiency of their organizations' operations and boost their productivity.
- Large multinationals are expected to benefit from the efficient communication with the Public Administration authorities and the reduced bureaucracy and red tape. SMEs and startups will also leverage the national digital platform to scale impact without performing significant investments, as they will be able to tap on the existing digital services, instead of developing their own from scratch. This will facilitate them to efficiently address resource constraints or allocate their workforce to higher-value tasks.
- Public Administration agencies are also uniquely positioned to take advantage of such a platform. Apart from providing an enhanced end-to-end experience to citizens and businesses, agencies will benefit from using common capabilities and make it easier and cheaper to run centralized digital services. In addition, the aggregation of open and shared data via the platform, will provide to the Public Administration entities a 360o view of the individuals and businesses they serve and will increase transparency.
- Finally, academia and research entities stand to benefit from such a platform by accessing new datasets. Namely, this holistic, unified, real-time, integrated, national dataset linked to the platform will be of significant help for research purposes. For instance, urban planning research will be transformed through the use of this interconnected data ecosystem. The provision of integrated road network, building and infrastructure blueprints combined with the real-time population data will support the development of effective land use, emergency management and evacuation plans.

### ► **The Functions of the National Digital Platform**

Any digital service enabled by the platform will leverage a set of core functions that will act as the building blocks for the digital services that private or public stakeholders shall develop. In more detail, the national digital platform shall provide:

- Authentication services and a unified, single-sign-on digital ID. This ID will allow users to access all provided digital services with a single secure username and password so that the services can be completed faster and more easily for all parties.
- A secure digital payment gateway that shall provide to citizens and businesses reliable and timely digital payments. With secure digital payments powered by the national digital platform, individuals will be able to transfer and receive payments with comfort and peace of mind.
- Geo-location and notification data services that will enable advanced responsiveness in a large number of smart applications, i.e. emergency medical response services, event planning and transportation logistics.
- Data analytics services that will enable the creation of personalized dashboards and in-depth data insights for individuals, businesses, and Public Administration entities.

The use of a set of common functionalities will support the creation of a common digital experience for the national "customers". At the same time, it will lead to increased efficiencies and it will allow businesses to focus their resources on the range and quality of the provided digital services, in order to unlock additional value for their users.

### ► **The Required Input of the National Digital Platform**

According to our observations, structural inhibitors of digitalization thus far have been the limited data availability, the poor data quality and the extensive fragmentation of data. A "silent", yet significant lever for unlocking trapped value for an economy/society is its capability to collect, aggregate and make interoperable the high volumes of data that are generated on a daily basis. For this reason, at the "heart" of the National Digital Platform we position data and the provision of analytics solutions and services. The design of a common, unified, integrated, standardized, real-time and actionable data repository that will collect data from national private and public sources and the introduction of big data and analytics solutions are expected indeed to become the core DNA of the National Digital Platform and act as the instigator for setting the digitalization of the Cypriot economy and society in motion.

Both public and private stakeholders will directly benefit from gaining access to such an extensive data repository and to next generation data analytics. The National Digital Platform shall become the single, unified data source for entrepreneurs and business owners seeking to learn, use and benefit from this. The platform will act as the secure hub to aggregate public and private data and apply comprehensive and proactive ePrivacy and cybersecurity mechanisms, standards and regulations to ensure the safety of the national and individual data.

The common and integrated repository that will include national private and public data and will be linked to the platform shall become the key differentiator vis-à-vis past efforts. In fact, Cyprus appears to have already in place a set of digital platforms and portals, focusing on different sectors and areas of activity. For instance, within the Public Administration, key representatives of such platforms are Ariadne, Cyprus's Government portal, Artemis, the Cypriot platform responsible for checking and safeguarding the credit profile of the Cypriot businesses and individuals, as well as the National Open Data portal that has been designed within the last years. Within the Communications sector, the Mobile Number Portability platform that operates in Cyprus since 2004, enables mobile telephone users to retain their mobile telephone numbers when changing from one mobile network carrier to another. These portals consist major steps towards the right direction, however they appear to be isolated efforts undertaken by private and public stakeholders, based on dispersed and fragmented data sources that could reveal only a partial picture of their users.

Now just imagine the degree of empowerment that these existing platforms could get, when "plugged" into the described National Digital platform (see Figure 3.5).

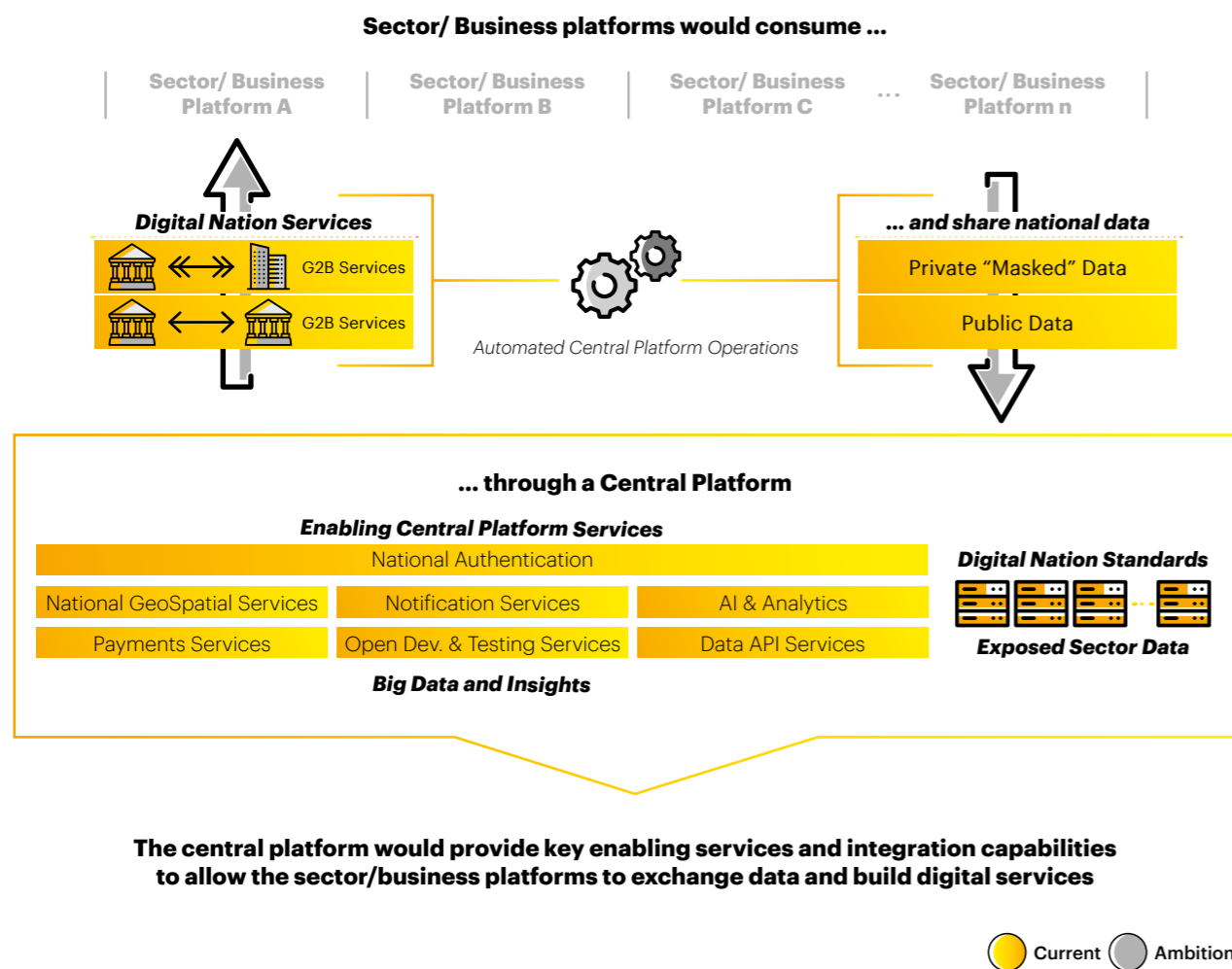


Figure 3.5. The role of the National Digital Platform



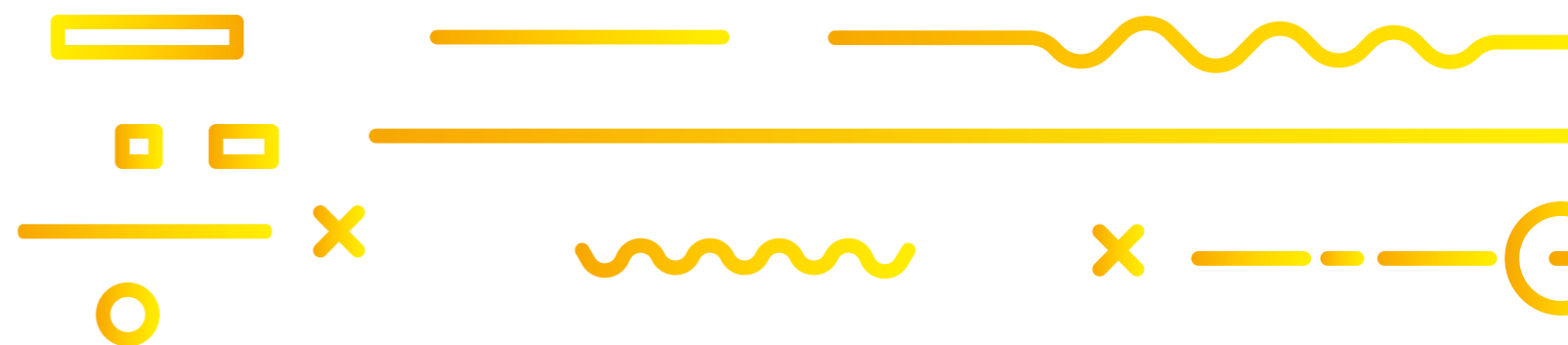
**Example: The smart parking app**

It is Thursday night and George is driving around Nicosia to get to his favorite restaurant, where he will have dinner with his friend Mike. As he approaches the restaurant, he starts getting really frustrated as he realizes that he is already late and the area is packed with parked cars, making it even more difficult for him to find a parking spot. At this point, he realizes that a few days earlier he downloaded this new smart parking app on his mobile, that promises to help users to find a parking space at minimum effort, so he thinks he could give it a try.

As soon as George opens up the smart parking app on his mobile, the digital parking service is activated. This service is provided by a respective smart transportation platform that is interconnected with the National Digital Platform. In order for the digital parking service to identify and pull the parking availability around George's position, it activates the geospatial functionality provided by the National Digital Platform. The geospatial functionality will identify George's position within the city and the smart parking service will demonstrate immediately on George's app all available parking places around him, as well as an interactive map on how to get to each place.

George selects the closest parking space and the app directs him to the place. As soon as he reaches the spot, the app demonstrates the fee that George has to pay for leaving his car there. There is no need for George to use cash for his payment, or even get out of his car. The smart parking app connects with the secure payment gateway that the National Digital Platform provides and George settles his payment through his application. Having parked and paid, George is now ready to enjoy his dinner.

Each time that George will use the application, the digital parking service will demonstrate real-time parking data that will be collected through the appropriate sensors and other data sources and will be aggregated in the National Digital Platform. As a parking spot is reserved, real-time data will be collected and the parking availability demonstrated in the app will be updated.



This example is only one of many services that could be developed through leveraging the functionalities of the National Digital Platform.

The implications for the future of public and private value creation via the national digital platform are indeed reaching. Indicatively, the National Digital Platform can:

- ▶ Increase the productivity and growth of the Cypriot economy through leveraging the “network multiplier effect”. Companies across all industries and customers will collaborate in a virtual “marketplace”, gaining better and faster access to each other. Participants will create value and exploiting accumulated technical expertise that will drive sustainable growth in faster and economically smarter ways.

For instance, in our case of the smart parking application, the successful implementation of the digital parking service is expected to gravitate an increasing number of customers that will download and use the app for their convenience. Success will breed success as business(es) that have developed this digital parking application will be rewarded and grow. At the same time, non-players within the transportation industry will be attracted by the critical mass and will start to develop new, complementary digital transportation services to serve an increasing customer base. For instance, initiatives with regards to real-time “road to vehicle” communication could be initiated. Through these new digital services, the users will receive real-time traffic information from central traffic management systems on their mobiles. High-risk situations will be identified in advance, resulting in driver alerts and warnings displayed on the users’ apps. The drivers could also be made aware of their surroundings such as traffic lights, traffic signals, parking lots and emergency situations to be able to act accordingly. Similarly, successful digital projects will motivate an increasing number of companies across all industries to turn towards the provision of digital services.

- ▶ Abolish industries silos and act as the connective tissue, “the glue”, for the digitalization of the Cypriot economy. This will be achieved through the provision of common services, seamless technology architecture and governance that will allow companies to streamline user experiences and move into higher value segments. In addition, the platform shall enable the formulation of partnerships between organizations of the same or different industries and the diffusion of best practices for the design of new sectoral platforms.
- ▶ Enable a “data-fueled” digital economy. Cyprus’s national digital platform will position data at the “heart” of the Cypriot digitalization journey. Data insights, the provision of next generation analytics and big data solutions and services will form the foundation of public-private collaboration sparking economic and social development.

The smart parking application example proves this case. Through the exploitation and analysis of open data, individuals are offered real-time traffic and parking availability information, enabling the re-direction of their vehicles away from heavy congestion and towards available parking spots. This type of services will not only contribute towards the individual’s increased convenience but they will also help the Public Administration agencies to improve city planning, optimize their transportation services and generate new revenue sources.

The ways in which the Public Administration could collaborate with the private sector to co-design similar type of services and applications are endless. From transportation to digital urbanization services (i.e. smart buildings, intelligent urban lightening, smart water network solutions), open data can provide major insights to all stakeholders and help them tackle existing social problems.

- ▶ Act as an innovation sandbox. By connecting players with data insights, the platform shall anchor continuous and disruptive innovation that will subsequently enhance the country’s digital maturity and will uplift Cyprus’s productivity growth.

In our smart parking app example, public and private stakeholders could use this service as their instigation point to experiment with new innovative ideas. The development of an Augmented City application could be such an innovative service to be developed. This app could leverage user geospatial information and overlay real-time information such as contextual points of attraction, interactive videos, targeted offers and event information on top of mobile device digital screens.

Stakeholders could also experiment with eCar and eBike sharing services. These programs could provide electric powered bike and car rentals for temporary use across the city. Pick-up and drop-off stations could be strategically located throughout urban and suburban areas, making them easily accessible from both public transport stations and popular locations.

- ▶ Stimulate the formation of new technology-based businesses, which are expected to expand and strengthen the National Digital Platform itself and will create a value add ecosystem.
- ▶ Lead to significant cost efficiencies for the digitalization of individual industries and businesses, since the improved use of assets will create efficiency gains.


With regards to the smart parking and transportation digital services example, new businesses that aim to join the platform and provide transportation services to their customers could realize significant benefits from leveraging the existing authentication, payment and geolocation functionalities, instead of developing them from scratch. This will lead to decreased duplication of efforts and costs and will allow businesses to focus their resources on designing innovative digital services that would unlock additional value for their users.




# FOUNDATIONAL STEPS FOR THE DESIGN OF THE NATIONAL DIGITAL PLATFORM

The deployment of the National Digital Platform requires a number of foundational moves that will set its realization in motion. Specifically:

## 1. Set up a consortium and develop local and global partnerships

 Key example with regards to partnership development is Estonia. The digital services provided by the Estonian X-Road platform are mainly built by local Estonian IT companies. The creation of the Estonian national digital platform has significantly boosted the IT sector and has enabled the creation of a start up community (known affectionately as the Estonian Mafia) that provide digital services and has exported their solutions to over 130 countries around the world<sup>52</sup>.


## 2. Create a strong brand to attract businesses and build credibility

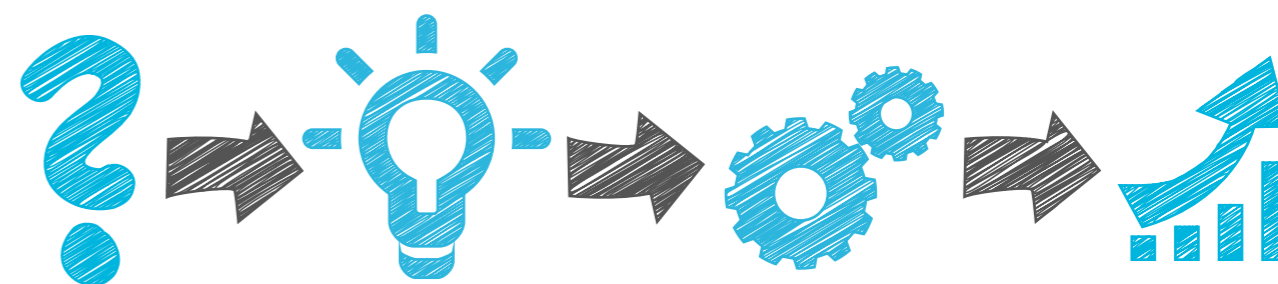
 Estonia has unified all partners involved in X-Road platform under one demo lab, the so-called “showroom” that showcases all partner solutions to guests. The showroom offers a full overview of the provided digital solutions and services and presents an overview of the main challenges and policies, as well as the platform’s technical infrastructure. The showroom enables all partners to gain a broad exposure and connect their brand with Estonia’s platform<sup>53</sup>.

## 3. Update relevant policies and standards and create a favorable regulatory environment

 In 2015, Dubai enacted a Data Sharing Law enforcing sharing of information between public and private sector entities. In addition, it leveraged a set of open infrastructure standards for its platform development activities. In addition, South Korea revamped in 2011 its Personal Information Protection Act to support the development of its smart cities platform and updated its data classification laws to support data collection at a national level. The law includes data protection rules and principles, including obligations on the data controller and the consent of data subjects, rights to access personal data or object to its collection, and security requirements. It also covers cookies and spam, data processing by third parties and the international transfer of data<sup>54</sup>.

## 4. Ensure that key infrastructure requirements are in place

 In Dubai, each sector that becomes “plugged-in” into the Smart Dubai Platform has a data sources network, which is connected to the Smart Dubai platform. The IoT sensors and data sources are designed, implemented and operated by industries’ key stakeholders following guidelines and using Smart Dubai’s central infrastructure<sup>55</sup>.



<sup>52</sup> <https://e-estonia.com/it-sector/>  
<sup>53</sup> <https://e-estonia.com/showroom/>

<sup>54</sup> <https://www.wamda.com/memakersge/2015/10/dubai-to-draft-data-sharing-law>  
<sup>55</sup> <http://www.smartdubai.ae/blueprint.php>, Accenture Analysis

# 3.6 OPERATIONALIZING THE DIGITAL VISION FOR CYPRUS

The successful operationalization of the digital vision for Cyprus rests upon two key prerequisites:

- Firstly, the translation of the three goals into a set of actionable initiatives
- Secondly, the clear segregation of duties and responsibilities for the involved key stakeholders

## ACTIONABLE INITIATIVES DEFINITION

In the following section, each of the three goals is decomposed and codified into a set of actionable, digital initiatives. Each group of the digital initiatives is also linked with the three digital levers of the Digital Economic Opportunity Index (DEOI) - digital skills, digital technologies, digital accelerators.

## 1<sup>ST</sup> GOAL “GRADUATE” FROM SETTING THE FOUNDATIONS



### Ensure Digital Connectivity



### Digital Accelerators

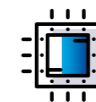
- 1.1.1 Accelerate efforts to deploy ultra-high-speed networks through the modernization of broadband infrastructure
- 1.1.2 Deploy a clear and flexible regulatory framework to explicitly cover the role that the Government shall play with regards to the support to be provided for the deployment of high-speed infrastructure
- 1.1.3 Support private investments towards the expansion of infrastructure without violating the principles of competition
- 1.1.4 Review the utilization of the spectrum’s frequency bands and identify those that are underutilized or that could be potentially shared or reallocated to different uses
- 1.1.5 Define new highspeed, wireless services that will use the available spectrum and add value to the Cypriot society
- 1.1.6 Collaborate with the private sector and academia to prepare a set of initiatives that will be incorporated in Cyprus’s broadband plan and will accelerate the deployment of 5G network
- 1.1.7 Create local information, training, and support groups to inform and educate select citizen segments and small businesses on the use of internet
- 1.1.8 Provide financial incentives for acquiring equipment and broadband access
- 1.1.9 Provide free Wi-Fi connectivity to citizens and visitors in the extended realm of public spaces (i.e. museums and libraries). The provision of free Wi-Fi will be targeted for specific events when visiting these public spaces and can be provided through a relevant mobile application



### Create Smart Regulation & Policies for the Future



### Digital Accelerators



### Digital Technologies

- 1.2.1 **Take Open Data off the bench and into the game**
- 1.2.1.1 Enhance relevant Open Data regulations to specify the sources of unreleased data that could be published and identify the licensing regulations for their re-use

- 1.2.1.2** Design a clear and actionable strategy for the enhancement of the Open Data portal that shall cover:
- The re-design of selected portal features, so that the portal becomes more user-centric, enhance and provide an enhanced user experience
  - The periodic upgrade of its infrastructure
  - The publishing all datasets in machine readable formats
  - The adoption of Open Data standards to ensure interoperability
  - The provision of search functionality according to different criteria, i.e. file formats
- 1.2.1.3** Increase the interaction, engagement and collaboration with the Open Data portal users and increase the uptake of data reuse
- 1.2.1.4** Document the economic impact of the use and deployment of Open Data
- 1.2.1.5** Organize more relevant public events (i.e. hackathons, training sessions, conferences, etc.) to raise awareness on the value of Open Data

## 1.2.2 Enhance Cybersecurity & ePrivacy

- 1.2.2.1** Both private and public-sector stakeholders that manage critical information infrastructure to review the existing cybersecurity strategy
- 1.2.2.2** The National CSIRT of Cyprus (Computer Security Incident Response Team) to establish formal communication channels with the European Network and Information Security Agency, the Computer Emergency Response Team for the EU institutions (CERT-EU) and other EU member states to enhance collaboration and exchange information on good practices with regards to cyber resilience
- 1.2.2.3** Businesses across all industries to proactively develop capabilities to detect, respond and recover for cyber-attacks
- 1.2.2.4** Incentivize (i.e. through tax or fiscal incentives) private companies to conduct risk assessment exercises for their organizations' infrastructure
- 1.2.2.5** Join forces with the private sector and academia to develop innovative solutions tailored to the needs of businesses or targeted sectors to effectively support them tackle cybersecurity threats
- 1.2.2.6** Set up targeted awareness programs to promote Cypriot citizens' understanding of online protection
- 1.2.2.7** Develop dedicated awareness-raising programs for the Cypriot industries, with special emphasis to industries managing critical information infrastructure, i.e. the financial and telecommunications sectors
- 1.2.2.8** The private sector to enhance cooperation with academia to develop cybersecurity educational offerings
- 1.2.2.9** Enhance the content of governmental web sites with information security related material i.e. presentations, webinars and lectures, where citizens and businesses will have access to get informed and updated on cybersecurity topics and global best practices

## 1.2.3 Ensure that the key enablers are in place

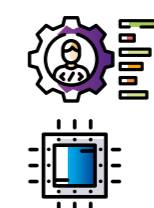
- 1.2.3.1** Accelerate and complete the implementation of the eID and eSignature initiatives to further enable data privacy and cybersecurity

# 2<sup>ND</sup> GOAL

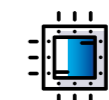
## "DRIVE" MASS ADOPTION OF DIGITAL



### Unlock the Human Capital



**Digital Skills**



**Digital Technologies**

### 2.1.1 Accelerate reskilling people

- 2.1.1.1** Launch new e-learning and open online courses (i.e. MOOCs) on ICT topics and new technologies, designed by ICT educational institutions and ICT industry stakeholders, to enable real-time learning at the point of need
- 2.1.1.2** Provide financial incentivization to disadvantaged groups (i.e. less educated, elderly, low income, unemployed etc.) to further encourage them to use the internet more frequently and participate in digital skills training programs
- 2.1.1.3** Provide financial incentives to public institutions (i.e. schools, libraries, etc.) to enable them to use their facilities, while not occupied, for the provision of digital skills training seminars and courses
- 2.1.1.4** Accelerate efforts to carry out targeted nation-wide, awareness-raising initiatives and advertise the benefits of using digital technologies
- 2.1.1.5** Local authorities, supported by NGOs and volunteers to organize regional community initiatives for the acquisition of basic ICT skills

### 2.1.2 Strengthen the talent pipeline from its source

- 2.1.2.1** The Ministry of Education and Culture to actively collaborate with academia and ICT industry stakeholders, to redesign and modernize the education curricula and teaching content
- 2.1.2.2** Design an evaluation system to assess student's digital capabilities across all levels of education and to provide a personalized digital training curriculum according to individual needs
- 2.1.2.3** Intensify the continuous professional development of teachers and trainers alike through the provision of online courses, i.e. MOOCs and incentivize them to achieve this
- 2.1.2.4** Introduce a digital skill accreditation scheme for teachers, in cooperation with respective certification authorities
- 2.1.2.5** Facilitate together with the private sector career mobility from the ICT industry into the teaching profession, to ensure the infusion of new digital skills into the education system

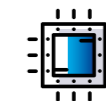
- 2.1.2.6** Strengthen the online dialogue with academia, policy makers and the private sector and forge closer collaboration to define ICT skill requirements, develop recommendations for the academic institutions and plug the gap in advanced ICT skills
- 2.1.2.7** The ICT sector to team up with academia and encourage work-based learning (i.e. paid traineeships, funded apprenticeships, etc.) as an integral part of the ICT education
- 2.1.2.8** Support teachers' lifelong learning through online courses, i.e. MOOCs and facilitate peer learning among teachers
- 2.1.2.9** Provide financial incentives, also supported by the private sector, for students to study STEM sciences at tertiary level
- 2.1.2.10** Support the doctoral and postdoctoral STEM education and enable this to act as the basis of science - driven innovation through the introduction of relevant programs.
- 2.1.2.11** Provide scientific research skills through doctoral and postdoctoral training to become an important element of the updated education policy
- 2.1.2.12** Set up a structured mechanism (i.e. paid internships for top STEM graduates within the Public Administration or in private organizations, etc.) to incentivize companies and Public Administration alike to increase their intake of STEM graduates

### **2.1.3 "New-skill" the workforce**

- 2.1.3.1** Organizations to create physical and virtual networks to facilitate community building, deliver access to valuable digital skills training, generate feedback and create access to potential new roles and projects
- 2.1.3.2** Public Administration, in collaboration with the Human Resource Development Authority of Cyprus, to provide targeted financial incentives to companies and commit employers to upskill their workforce and to implement lifelong learning policies within their organizations
- 2.1.3.3** Make selected training programs mandatory and accompany them with appropriate certifications to comply with the European professional accreditation schemes
- 2.1.3.4** Design and introduce an open, e-Learning platform that will provide "snack-sized" training programs on digital skills, tailor-made for different industries and sizes of enterprises
- 2.1.3.5** Organizations and Public Administration entities alike to reskill their higher echelons
- 2.1.3.6** Organizations to redefine and co-create employment opportunities through more responsive role-based and gig-like work
- 2.1.3.7** Organizations to tap current "wisdom workers" and recently retired executives to coach new talent coming up through the ranks



## **The Digitalization of the Public Administration**



### **Digital Technologies**

### **2.2.1 Redesign end-to-end public services**

- 2.2.1.1** Prioritize, evaluate and redesign selected public services
- 2.2.1.2** Adopt a "mobile first" strategy to support the design of mobile-friendly, public-sector websites and make services and information easily-accessible through portable devices
- 2.2.1.3** Simplify and re-engineer internal processes that support the selected public services using an "outside in" approach
- 2.2.1.4** Eliminate overlapping processes with no value added, and selectively outsource repetitive and transaction-heavy internal processes with limited value

### **2.2.2 Foster an agile Delivery Model, a multi-speed IT infrastructure and a new Sourcing Mechanism**

- 2.2.2.1** Alter the IT delivery model and embrace an iterative, agile approach for the development of new IT services
- 2.2.2.2** Implement digital, cloud and as-a-Service solutions, assets and offerings
- 2.2.2.3** Adopt a set of common standards and a common frame for the management of IT architecture
- 2.2.2.4** Transform the Public Administration sourcing strategies to move away from traditional procurement processes, inflexible "waterfall" approaches and exhaustive RFPs and provide the missing flexibility to support the agile software development

## **3<sup>RD</sup> GOAL**

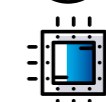
### **"ARCHITECT" NEW RELATIONSHIPS**



## **"Architect" new relationships**



### **Digital Accelerators**

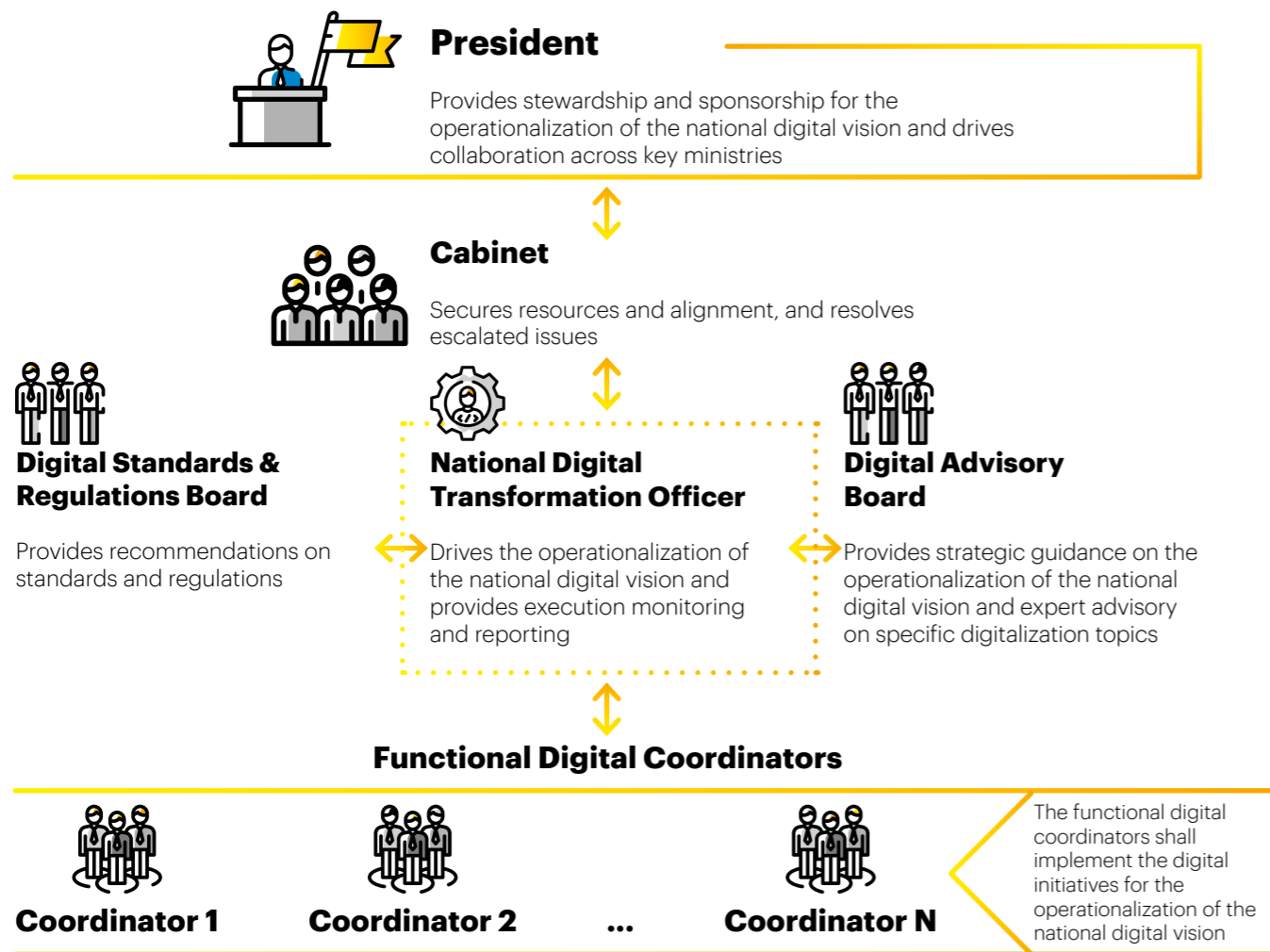


### **Digital Technologies**

- 3.1** Set up a consortium and develop local and global partnerships
- 3.2** Create a strong brand to attract businesses and build credibility
- 3.3** Update relevant policies and standards and create a favorable regulatory environment
- 3.4** Ensure that key infrastructure requirements are in place

# THE SUGGESTED NATIONAL DIGITAL GOVERNANCE MODEL

The successful operationalization of Cyprus's Digital Vision specifies as compulsory the setup of an effective National Governance Model. This model will require Government representation at the highest level. It will introduce robust accountabilities and clear segregation of duties. This will ensure clarity on execution and an uninterrupted flow of information across the Governance structure.



Suggested role descriptions, key accountabilities and responsibilities are presented in the table below:



 <b>Role</b>	 <b>Key Responsibilities</b>
<b>President</b>	<p>The President will be the ultimate driver of the operationalization of the national digital vision and will play a key role in providing direction and alignment across all stakeholders.</p> <p>In more detail, the President will:</p> <ul style="list-style-type: none"> <li>➤ Provide strategic direction and ensure accountability</li> <li>➤ Pledge continuous support and sponsorship</li> <li>➤ Advocate the operationalization of the national digital vision in national and international fora</li> </ul>
<b>Cabinet</b>	<p>The Cabinet will sponsor the operationalization of the national digital vision, encourage collaboration across key players, approve funding, resolve escalated issues, and oversee progress and value realization.</p> <p>In more detail, the Cabinet will:</p> <ul style="list-style-type: none"> <li>➤ Endorse and sponsor the operationalization of the national digital vision</li> <li>➤ Promote, prioritize and ensure alignment between sectoral digital initiatives</li> <li>➤ Decide on appropriate funding mechanisms and approve government budget allocation for the operationalization of the national digital vision</li> <li>➤ Address overarching challenges and resolve issues escalated from the National Digital Transformation Officer</li> <li>➤ Ensure the ongoing empowerment of the National Digital Transformation Officer as the focal point for the operationalization of the national digital vision</li> <li>➤ Oversee the overall progress against strategic objectives and monitor value realization</li> </ul>

Figure 3.6. The Proposed Structure of the National Digital Governance model

### National Digital Transformation Officer

The National Digital Transformation Officer works with a dedicated team to lead the operationalization of the national digital vision. The National Digital Transformation Officer reports to the President and coordinates with all the ministries and institutions including the private sector. Manages the continuous alignment between the functional digital coordinators and the relevant EU stakeholders.

In more detail, the National Digital Transformation Officer will:

- Be accountable for the development and operationalization of the national digital vision
- Establish the necessary collaborative structures and mechanisms for the implementation of the national digital initiatives
- Liaise with and coordinate the work of the functional national coordinators
- Liaise and coordinate with digital transformation programs and initiatives at an EU level
- Specify and identify the necessary funding and resources for the operationalization of the national digital vision
- Ensure the on-time and on-budget operationalization of the national digital vision
- Escalate issues to the Cabinet and coordinate Governance meetings
- Be responsible for the preparation and publication of periodic reports on the progress of the operationalization
- Lead digital public awareness initiatives

### Digital Standards & Regulations Board

The Digital Standards & Regulations Board shall leverage expertise and international best practices to provide recommendations and advice on developing/ updating the appropriate standards and regulations required for the operationalization of the national digital vision.

In more detail, the board will:

- Collaborate with the National Digital Transformation Officer, academia and other private sector stakeholders to identify necessary regulation and standards adjustments
- Advise on the adoption of international standards and regulations
- Advise on mechanisms for standard & regulation awareness, dissemination, adoption, and compliance

### Digital Advisory Board

The Digital Advisory Board will consist of public and private sector stakeholders, as well as federations and associations. It will bring expertise and know how on different elements of the operationalization of the national digital vision and help set up operations. At the same time, the board will provide expert advisory on specific digitalization topics and cross-sectoral related tasks.

In more detail, the board will:

- Advise on strategic direction and key challenges with regards to the operationalization of the national digital vision
- Serve as a “sounding board” for strategic digital decisions
- Provide insights on relevant global practices
- Conduct selected reviews on progress and outcomes of digital initiatives
- Act as an international advocate for the operationalization of the national digital vision

### Functional Digital Coordinators

The Functional Digital Coordinators will be placed in each government ministry, relevant institution and private sector body. They will be responsible for the operationalization of the national digital vision in their respective functional area. They will also provide feedback and support for the continuous review of the relevant digital initiatives.

In more detail, the Functional Digital Coordinators will:

- Coordinate plans for the implementation of digital initiatives and actions in their functional area in alignment with the National Digital Transformation Officer
- Ensure the implementation of developed plans, and track and report progress, resource management and outcomes achieved
- Escalate issues to the National Digital Transformation Officer
- Where relevant, collaborate with the corresponding boards (Standards & Regulations/ Advisory) on the development or use of required national standards and policies

## 3.7 THE 10 KEY SUCCESS FACTORS

The successful operationalization of Cyprus's Digital Vision rests upon ten Key Success Factors:

- 1. The digital vision shall become an integral part of the national economic policy**
- 2. Commitment from the highest level of political leadership must be secured**
- 3. The support for the operationalization of the digital vision shall be bipartisan to ensure continuity**
- 4. The active monitoring of the digital transformation shall be performed from a structured Governance mechanism**
- 5. The available public funds shall be the means and not the end for the execution of the digital vision**
- 6. The design and enforcement of a favorable regulatory framework is a critical milestone**
- 7. The uptake of nation-wide, up-to-date infrastructure is the "utility" for Cyprus's rotation to digital**
- 8. The digital upskilling and reskilling of Cyprus's workforce is the "fuel" for the country's digital rotation**
- 9. The Cypriot industries have a major role to play in the country's rotation to digital and shall embrace this digital opportunity**
- 10. The setup of the National Digital Platform will act as a national digital "accelerator"**



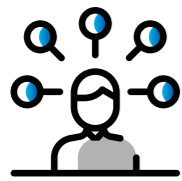
# APPENDIX-STUDY NOTES

## 1. DIGITAL ECONOMIC VALUE INDEX (DEVI) METHODOLOGY

The DEVI index is used to estimate the size of the “digital economy”. Traditional measures of the digital economy have focused largely on technology infrastructure, IT and communications sector investment, eCommerce, and broadband penetration rates. Such approaches yield relatively small estimates of digital output (around 5.2 percent of GDP for mature economies) as they fail to account for the whole scope of digital.

Based on national accounting frameworks, the DEVI draws a “boundary” around the Gross Domestic Product (GDP) of an economy that is derived from digital inputs to production. The index provides a more comprehensive and well-rounded view of what constitutes a digital economy by tracing the use of digital skills, equipment and intermediate goods in the production of all goods and services.

The methodology is designed to capture the contribution of the following digital inputs:



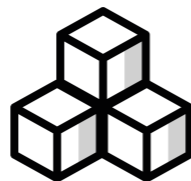
### Digital workforce

Defined as those workers for whom an intermediate working knowledge of digital technologies is required to perform their jobs



### Digital technologies

Defined as hardware, software and communications equipment



### Digital intermediate goods and services

Defined as the digital intermediary goods and services that are used for the design and production of the final products and services

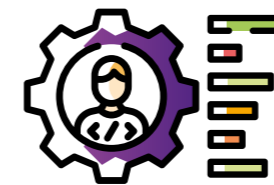
Digital Economic Value Index - Inputs

## 2. DIGITAL ECONOMIC OPPORTUNITY INDEX (DEOI) METHODOLOGY AND SOURCES

### 2.1 DIGITAL ECONOMIC OPPORTUNITY INDEX (DEOI) METHODOLOGY

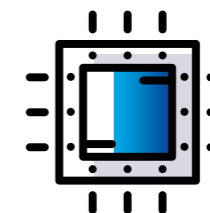
The DEOI index compliments the DEVI by providing a detailed assessment of the underlying digital maturity of an economy and/or industry. It captures the extent to which countries and industries are embracing digital technologies and capitalize on the economic opportunities.

The index consists of three mutually exclusive and equally weighted levers: Digital Skills, Digital Technologies and Digital Accelerators.



### Digital Skills

The digital nature of occupations and the skills and knowledge required for people to perform their jobs



### Digital Technologies

The productive assets related to digital technologies (hardware, software and communications equipment)



### Digital Accelerators

The environmental, cultural and behavioral aspects of digital components of the economy that support digital entrepreneurship or activities

Digital Economic Opportunity Index - 3 levers



The DEOI index is normalized on a 0 to 100 scale. The higher the score, the broader and deeper the adoption of digital technologies and associated skills, ways of working, and regulations. A country achieving the top score on every single indicator would attain a score of 100 overall. Each DEOI lever comprises of three key dimensions as presented below.

### Digital Skills

- > **Stock of digital Skills:** degree to which the ICT workers are present in the economy
- > **Digital Skills development:** effort performed by companies to train their employees in digital skills
- > **Digital ways of working:** presence of digital assets and tools such as mobility, social media, etc. in the day to day tasks

### Digital Technologies

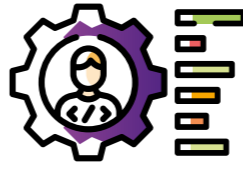
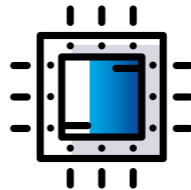

- > **Digital capital stock:** degree of investment by companies in software and hardware assets
- > **Digital engagement:** use of digital assets in interactions with employees and customers
- > **Digital enablement:** adoption of innovative technologies such as Cloud, Analytics and IOT

### Digital Accelerators

- > **National communications infrastructure:** availability and quality of internet connectivity and degree of access penetration of an economy
- > **Open Data & E-Participation:** degree to which a Government's actions and investments incorporates digital as a key asset, in order to promote the use of Open Data and enhance e-Participation
- > **Digital business environment:** facilities provided by the environment to digital ways of working and digital business models

## 2.2 DIGITAL ECONOMIC OPPORTUNITY INDEX (DEOI) SOURCES

Each DEOI key dimension is further decomposed to a set of indicators that have been collected from various 3<sup>rd</sup> party sources.

Lever	Dimension	Data Source
 Digital Skills	Stock of digital Skills	DESI, Eurostat
	Digital Skills development	WEF, Eurostat
	Digital ways of working	Word Bank, OECD, Eurostat
 Digital Technologies	Digital capital stock	EU Klems
	Digital engagement	IDC, Eurostat
	Digital enablement	IDC
 Digital Accelerators	National communications infrastructure	ITU
	Open Data & E-Participation e-Participation	Open data barometer, UN, WEF
	Digital business environment	Word Bank, WEF, Eurostat

Digital Economic Opportunity Index - Sources

### 3. RELATIONSHIP BETWEEN DIGITAL ECONOMIC OPPORTUNITY INDEX (DEOI) AND GDP UPLIFT

Accenture and Oxford Economics analysis reveals a significant relationship between the Digital Economic Opportunity Index (DEOI) and economic growth. In fact, without altering per se the existing capital/labor inputs, a DEOI score increase can lead to productivity gains in an economy enabling a GDP increase.

Regression analysis was used to explore the elasticity of Total Factor Productivity (TFP) to changes in DEOI scores. Total Factor Productivity (TFP) measures the effectiveness with which capital and labor inputs are combined to produce economic wealth and is usually influenced by technological improvements and innovations. Through the control of capital and labor inputs, we observed the distinctive impact that digital maturity has on TFP by lowering the marginal cost of production. This productivity gain was then associated with a potential GDP uplift of the Cypriot economy in order to estimate the effect that the increase of digital maturity can have on the national GDP.

### 4. DIGITAL CAPABILITIES SURVEY METHODOLOGY AND SAMPLE DEMOGRAPHICS

#### 4.1 DIGITAL CAPABILITIES SURVEY METHODOLOGY

The analysis was based on the Digital Capabilities Survey open from July 13, 2017 to October 30, 2017.

The Digital Capabilities Survey was completed by C-level/ senior management executives of Cypriot organizations.

The survey was structured around 8 dimensions, 26 sub-dimensions and 48 questions that covered organizations' key digital capability areas.

##### DIGITAL CAPABILITIES SURVEY

- > **Strategy & Governance**
- > **Organization & Collaboration**
- > **Customer Experience & Interaction**
- > **Technology & Platforms**
- > **Information & Insights**
- > **Growth & Innovation**
- > **Operations & Ecosystem**
- > **Security & Privacy**

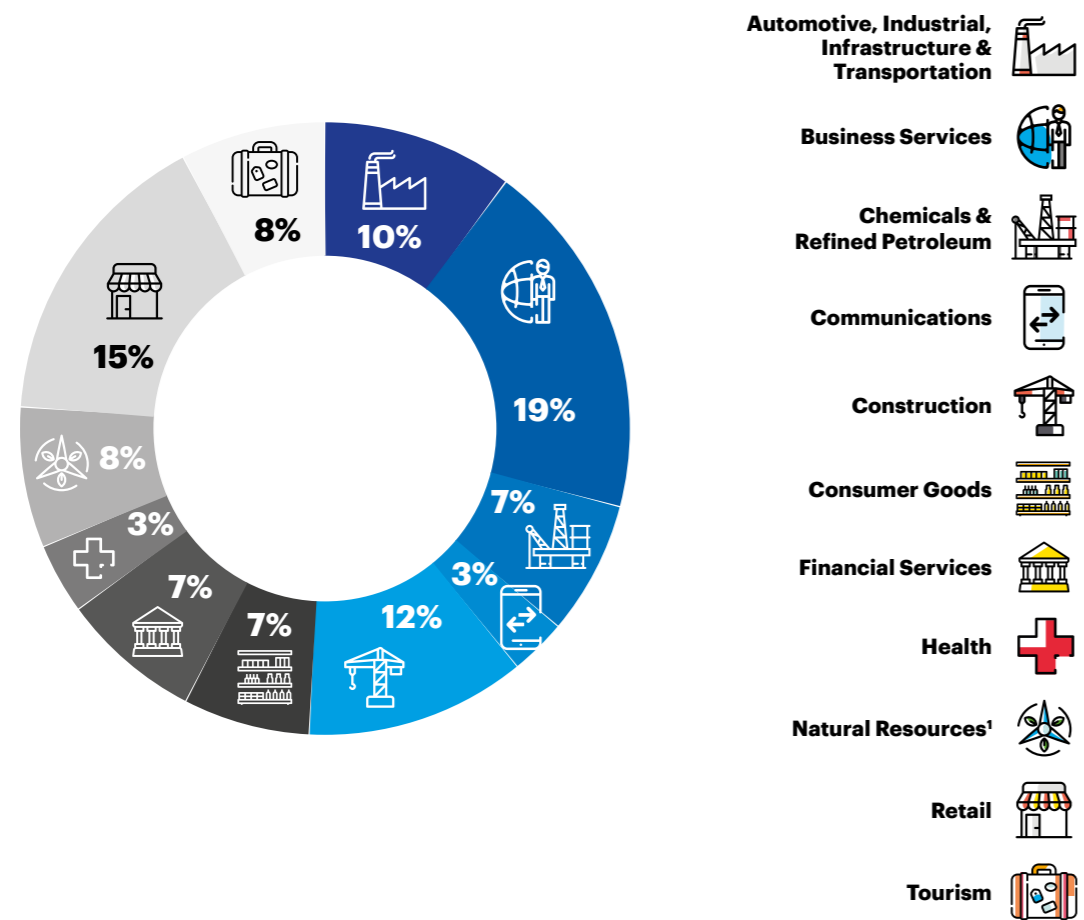
For each Question, a 5 level Likert scale was used to evaluate the respondents' perceived digital capabilities.



5 level Capabilities scale

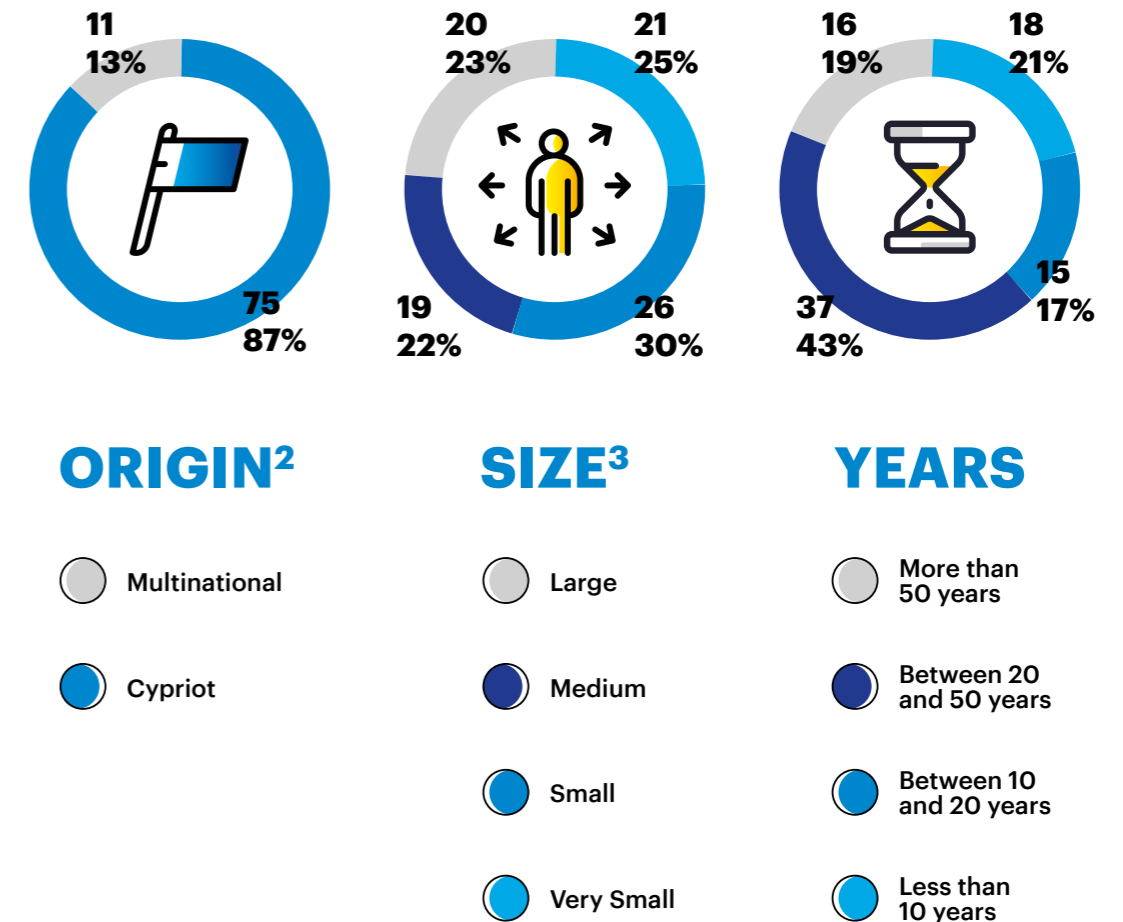
## 4.2 DIGITAL CAPABILITIES SURVEY SAMPLE DEMOGRAPHICS

The participative sample consists of 86 organizations, with the following distribution across Cyprus's key industries.



<sup>1</sup> Natural Resources industry includes the following sectors: Crop and animal production, forestry, fishing, mining and quarrying, manufacture of basic metals, manufacture of other non-metallic mineral products.

Digital Capabilities Survey - Industry Breakdown of Participants



<sup>2</sup> Cypriot: Domestic company operating exclusively in Cyprus. Multinational: Company operating in at least one country other than its home country  
<sup>3</sup> Based on Eurostat clustering by number of employees (Very Small - less than 10, Small - less than 50, Medium - less than 250, Large - more than 250)

Digital Capabilities Survey - Demographics

# 5. INDUSTRY MAPPING USED FOR DEVI & DEOI INDEXES AND DIGITAL CAPABILITIES SURVEY

The industry classification used was based on the NACE Rev. 2 classification of economic activities<sup>3</sup>. Economic activities defined as per NACE Rev. 2 were grouped into industries to enable the comparability of CY's results with those of other countries within our sample. The grouping is presented in table 5 below.

It should be noted that due to limited availability of 3<sup>rd</sup> party indicator indexes, the DEVI and DEOI were not evaluated for the Cypriot Education and Health industries. Moreover, no detailed analysis was performed with regards to the Digital Capabilities Survey for the Utilities and Education industries due to the limited response rate from organizations within these industries.

NACE code	NACE Description
<b>1. Automotive, Industrial, Infrastructure and Transportation (AIIT)</b>	
H49	Land transport and transport via pipelines
H50	Water transport
H51	Air transport
H52	Warehousing and support activities for transportation
G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
C26	Manufacture of computer, electronic and optical products
C27	Manufacture of electrical equipment
C28	Manufacture of machinery and equipment n.e.c.
C29	Manufacture of motor vehicles, trailers and semi-trailers
C30	Manufacture of other transport equipment
C33	Repair and installation of machinery and equipment
<b>2. Business Services</b>	
M69	Legal and accounting activities
M70	Activities of head offices; management consultancy activities
M71	Architectural and engineering activities; technical testing and analysis
M72	Scientific research and development
M73	Advertising and market research
M74	Other professional, scientific and technical activities
J62	Computer programming, consultancy and related activities
J63	Information service activities
<b>3. Chemicals &amp; Refined Petroleum</b>	
C19	Manufacture of coke and refined petroleum products
C20	Manufacture of chemicals and chemical products
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	Manufacture of rubber and plastic products
<b>4. Communications</b>	
J58	Publishing activities
J59	Motion picture, video and television programme production, sound recording and music publishing activities
J60	Programming and broadcasting activities
J61	Telecommunications
H53	Postal and courier activities
<b>5. Construction</b>	
F	Construction

<sup>1</sup> NACE is the acronym for "Nomenclature statistique des Activités économiques dans la Communauté Européenne". NACE is the statistical classification of economic activities in the European Community and is the subject of legislation at the European Union level, which imposes the use of the classification uniformly within all the Member States

<b>6. Consumer Goods</b>	
C10	Manufacture of food products
C11	Manufacture of beverages
C12	Manufacture of tobacco products
C13	Manufacture of textiles
C14	Manufacture of wearing apparel
C15	Manufacture of leather and related products
C31	Manufacture of furniture
C32	Other manufacturing
<b>7. Education</b>	
P	Education
<b>8. Financial Services</b>	
K64	Financial service activities, except insurance and pension funding
K65	Insurance, reinsurance and pension funding, except compulsory social security
K66	Activities auxiliary to financial services and insurance activities
<b>9. Health</b>	
Q	Human health and social work activities
<b>10. Natural Resources</b>	
A1	Crop and animal production, hunting and related service activities
A2	Forestry and logging
A3	Fishing and aquaculture
B	Mining and quarrying
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	Manufacture of paper and paper products
C18	Printing and reproduction of recorded media
C23	Manufacture of other non-metallic mineral products
C24	Manufacture of basic metals
C25	Manufacture of fabricated metal products, except machinery and equipment
<b>11. Retail</b>	
G46	Wholesale trade, except of motor vehicles and motorcycles
G47	Retail trade, except of motor vehicles and motorcycles
S95	Repair of computers and personal and household goods
<b>12. Tourism</b>	
I55	Accommodation
I56	Food and beverage service activities
N79	Travel agency, tour operator and other reservation service and related activities
<b>13. Utilities</b>	
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage; waste management and remediation activities

Figure 4.1. Digital Capabilities Survey - Demographics

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